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Volume XX.

THE AMERICAN OAKS.

BY

WILLIAM TRELEASE.

CONTENTS.

	Page.
Introduction:	
Prefatory	1
Historical	1
The study of types	2
Concept of species	2
Characters:	
Habit	3
Bark	3
Wood	4
Twigs	4
Buds	5
Stipules	5
Vernation	5
Leaf—	
Petiole	5
Margin	6
Veining	6
Pubescence	6
Structure	7
Surface	7
Color	7
Persistence	7
Inflorescence	8
Flowers—	
Perianth	9
Stamens	9
Pistil	9
Fruit—	
Cup	10
Acorn	11
Embryo	11
Seedlings	12
Abnormalities:	
Teratology	12
Galls	12
Hybridity	12
List of American hybrids	13
Taxonomy:	
Affinities	17
Taxonomy—Continued.	Page.
Genera of Fagaceae	18
Subgenera of Quercus	18
Groups of species	19
Relationship of groups	19
Nomenclature	21
Synonymy	21
Descriptions	21
Illustrations	21
Geographic distribution:	
Range	22
Regions	23
Relative abundance of species	23
Geologic history:	
The genus at large	24
American fossils	24
Nomenclature	25
Classification	25
Succession	25
Persistence	25
Abundance	26
Affinities	26
Species reported as fossil in America	26
Evolution	33
Descriptive treatment:	
The genus Quercus	34
Subgenera or Sections	35
Systematic enumeration of existing species	35
Revision:	
Leucobalanus	41
Protobalanus	118
Erythrobalanus	120
References	207
Explanation of plates	215
Indexes:	
Collections	233
Regions	243
Names	247
Illustrations.	

ILLUSTRATIONS.

(Explanations are given at pp. 215–230.)

TEXT FIGURES.

	Page.
1. Cross section of petiole of *Quercus palustris* ×25.	6
2. Extrorse androecium of *Quercus macrocarpa* ×10.	9
3. Longitudinal section of pistillate flower and cupule of *Quercus macrocarpa* ×5	10
4. Longitudinal section of pistillate flower and cupule of *Quercus imbricaria* ×25	10
5. Cross section of pistillate flower and cupule of *Quercus macrocarpa* ×5	10
6. Seed, with nearer side of acorn shell removed, of a typical red oak, *Quercus palustris* ×2	11
7. Seed, with near side of acorn shell removed, of a typical white oak, *Quercus alba* ×2	11

PLATES.

	Plate.
Frontispiece. Distribution map for Quercus.	
Habit of growth	1–3
Types of bark	4
Types of wood	5–9
Types of pubescence	10
Fossil American oaks	11–13
Existing American white oaks	14–208
Existing Intermediate oaks	209–215
Existing red oaks	216–420

THE AMERICAN OAKS.

By William Trelease.

INTRODUCTION.

PREFATORY.

Though the oaks of the United States have been made the subject of numerous publications, and botanists are fairly well agreed as to the types and characters of existing species except for differences of opinion on the divisibility of certain forms which are sometimes regarded collectively as species, those of the region to the south of the United States have not been passed in review for a generation, and much confusion exists in herbaria which contain collections of these tropical forms. If, as is unquestionably the case, they can be understood correctly only by studying them comparatively in the field and with at least some cultural essays, it is equally certain that such a study must be based on a knowledge of what is meant by the names already applied to many of them; it must follow the collective study of types and original descriptions in the herbarium and library, and can be materially furthered by an accounting for the many other collections on which as yet nothing has been published.

It was in the hope of obtaining such knowledge that in 1912 I undertook an examination of the material preserved in the larger herbaria of the world. The original plan was to confine my study to the species of the American Tropics, those of the United States, already much studied, scarcely seeming to merit the detailed attention paid to those on which less has been published. For this reason, while every specimen from the south was accounted for to the best of my ability, neither variations nor geographic details were noted for those of the north. In revising my notes for publication, however, it has seemed best to include all of the species that are known to exist in the entire American flora; and this has been done, though in a summary way but with ample references, for the oaks of the United States.

HISTORICAL.

The stately form, often useful galls, fruit, or bark, and very valuable wood of the oaks have caused a good deal of attention to be given them at various times. Even before the epoch-making publications of Linnæus, in the middle of the eighteenth century, a number of North American species had been collected, figured, or commented on. About the end of that century several continental writers pictured and described others, while botanists resident in America added to their number. The pioneer publications of this period are those of Née, who in 1801 described something over a dozen species collected a few years earlier by himself or his associates, among whom were Pavon [1] and Haenke, in Mexico and what is now southern California; and of the Michaux, father and son, who had an unexcelled field knowledge of the trees of the eastern United States. To the sumptuous publications of the latter, beginning with a work limited to our oaks, time has brought additions but few rectifications. With these must be included the superb work of Humboldt and Bonpland in the account of their own travels in tropical America.

For nomenclatorial corrections rather than additional facts, the posthumous editions of Linnæus's Species Plantarum, especially that by Willdenow, and the Nomenclator of Endlicher, possess undisputed historic value; but it is easily to be seen that the absence of authentic

[1] Urban (Symbolæ Antillanæ, 3:99) expresses the belief that West Indian and Mexican plants labeled in herbaria as from Pavon were collected probably by others than Pavon himself.

specimens for comparison led Willdenow into a number of errors in the identification or understanding of certain species from which he differentiated others that came under his eye.

In 1864 Alphonse de Candolle, in the Prodromus, gave the only monograph of the entire genus Quercus that has been undertaken since revisions of Linnæus's comprehensive works were abandoned; and this possesses the rare value attaching to a comparative study of type materials, nearly all of which passed under his eye. In addition to accounting for the contents of minor publications, this monograph brought into correlation with the other species a considerable number collected by the Belgian botanist Galeotti and the Danish botanist Liebmann, which had been described in important if brief papers. Among still later publications are to be noted the Silva of Professor Sargent, which stands foremost for the United States; and the beautiful volume of plates illustrating many of the tropical American species prepared by Liebmann and edited and brought out after his death by Oersted, himself an expert collector and an accomplished analyst of detailed characters, in which respect he has been excelled, if at all, only by our own botanist Engelmann, to whom must be ascribed much of the interest and close attention concentrated on North American oaks of late years.

THE STUDY OF TYPES.

In the present confused naming of tropical American oaks in herbaria no study of them seemed to me possible which did not begin with the types of the earlier species and progressively pass in review those of the later species. How true this must be of those seldom-seen trees is shown by the long-persistent misunderstanding of some of the commonest and most distinct of our own northern oaks—for instance, that which should properly be called *Q. nigra;* and the real *rubra* of Linnæus, to which Professor Sargent has called recent attention.

Though it did not prove possible for me to carry out my original plan of examining the types in chronological order, and I found myself frequently compelled to account for modern collections before seeing earlier types, this plan was followed as closely as possible; and while de Candolle's advantage of having all of the significant specimens together for comparison and recomparison has been quite out of the question in this study, photographs in natural size that were made as it progressed have gone far toward replacing the specimens themselves for this purpose.

The most fundamental of the type collections is that of Née, preserved at Madrid. This alone I have not seen; but his specimens were examined by de Candolle, so that the brief diagnoses and rather long annotations of their author have been supplemented by the observations of the acute Swiss botanist. A series of excellent and seemingly accurate pencil sketches made from these types about 50 years ago under the direction of Professor Lange for use in Liebmann's illustrations of the group has shown much about the specimens, and a partial set of cotypes apparently, labeled as from Pavon, occurs in the Boissier herbarium at Geneva; but some of the Née species are still questionable, and these unfortunately are inadequately represented by types even at Madrid. The other collections of types I have seen almost in their entirety: those of Humboldt and Bonpland at Paris, and at Dahlem—where duplicates were taken first by Willdenow and afterwards by Kunth; those of Liebmann and Oersted at Copenhagen, or, in case of a number of Liebmann's species, at Kew; those of Martens and Galeotti at Brussels; those of de Candolle in the Candollean herbarium, or the other great collections at Geneva; and the more recent types of von Seemen either at Dahlem or in other collections examined by him in a revision broken off by his death several years ago.

CONCEPT OF SPECIES.

Though considerable acquaintance with the oaks of the eastern United States had predisposed me to a very conservative treatment of those of the region to the south, especially since the polymorphism of such aggregates as center about *Q. velutina*, *Q. nigra*, and *Q. stellata* is now demonstrated in American herbaria, and since numerous hybrids are known or believed to occur between related forms, my practice through the present investigation has been to accept tenta-

tively the published species and to describe their originals from my own viewpoint of characters, reserving their final disposal for a later stage of the study. It now seems fortunate to me that this was done, for as the work progressed a conviction has grown that in most cases a union of these nominal species can be effected, if at all, after their much fuller study in the field, preliminary to which the types must be kept distinct.

My conclusion is that very few of the older nominal species from different geographic regions are likely to be united, while the differences presented by the enormous number of later collections are such as to compel their segregation on the same rather close lines. That descriptions of both old and new species are more detailed here than has been customary until very recently, and that measurements supplement or replace verbal indications of size, should make future revisions less laborious than the present has proved, and ought to simplify the field study to which this herbarium study is frankly preliminary. If data are often lacking on habitat, size, appearance of bark, ecological association, etc., this results for the most part from the fact that few collectors in the past have given to these points the attention that the present generation recognizes as desirable, even though it does not record it in most cases.

CHARACTERS.

HABIT.

Though a lover of trees familiar with the oaks of a given region often recognizes each of them at a distance, massed or singly, by size, outline, or spring or fall coloring, just as the woodsman distinguishes them by the appearance of the bark or the lumberman by obvious characteristics of the wood, these differences shade away so gradually when a large number of species are compared and are of so little availability in the herbarium as to make their utilization impracticable in a monograph.

In mountainous and arid regions, oaks, like other woody plants, commonly decrease in size and symmetry of form as they pass from more favorable to less favorable conditions of moisture, temperature, and exposure to the wind; but so far as our species are concerned there are few definitely known cases of a species presenting gradual transition from trees to fertile shrubs except under such conditions. Among the northern oaks, *Quercus macrocarpa*, normally a large and massive tree and one of unusually extended range, exhibits such a reduction in size as it reaches its limits in the sand hills, as does *Q. stellata* in the Northeast. A comparable polymorphism is frequent among the oaks of California and the Rocky Mountains, though the various habit forms, as, for instance, noted by Engelmann in Colorado, are commonly characterized by other, if small, differences. Slight though the other distinctions are between the polymorphic eastern forms known as *Q. Muehlenbergii* and *Q. prinoides*, few botanists are willing now to see only a single species in the last-named shrub and the large tree designated by the former name.

If well applied, the percurrent growth of such species as *Q. palustris* (pl. 1) with its sometimes pendent branches, and the open rugged growth of *Q. alba* or *Q. macrocarpa* (pl. 2) in our own flora, or the oblong habit of *Q. parviglans* and the rounded head of *Q. callosa* or *Q. pilicaulis* (pl. 3) in the mountains of Guatemala, should prove of the greatest diagnostic value, but the time has not come for the general utilization of such characters.

BARK.

There is no question that in color and surface the bark of different species differs in oaks quite as greatly as in any genus of North American trees. That it is dark and fissured in what are known collectively as black oaks (*e. g.*, *Q. velutina*, pl. 4), and rather gray, checked and often flaking[2] in what are called white oaks (*e. g.*, *Q. pilicaulis*, pl. 4), is a fact too long and well known to require comment. In each of these groups, however, the bark differences between closely related species are sometimes very clearly marked, so that, for instance, when the American

[2] This flaking is said by Davis (Rep. Mich. Acad. Sci. 6:82) to be caused by *Corticium Oakesii*, a common corticolous fungus said to be absent from the thick furrowed bark.

white oak, *Quercus alba*, and the English oak, *Q. pedunculata*, are grown side by side, even a casual observer notes the darker color and more compact surface of the bark of the latter, which suggests somewhat a black oak. Before it was recognized by botanists that the red oak of the middle Mississippi Valley comprises two or more species, it was observed that some trees, now known to belong to the species that has been called *Q. Schneckii* or *Q. Shumardii*, were distinctly rougher barked than those of what has been taken currently for *maxima*—or *rubra* as it is called usually—a difference especially noticeable on the larger branches. Such differences, and they are manifold, though they vary greatly in every species, should prove of diagnostic value when they have become sufficiently known and accurately described to form part of specific or group descriptions; and the color of the inner bark characterizes the American quercitron or black oak, *Q. velutina*, as its thickness and compressibility do the cork oak of the Mediterranean, *Q. Suber*. The most characteristic bark differences between the oaks of the United States are illustrated from photographs in Hough's Handbook of the trees of the northern States and Canada.

WOOD.

As a genus, Quercus is distinguished even by amateurs as having hard wood with large ducts crowded at the beginning of each year's growth, and some very coarse, distant medullary rays, in addition to very fine and very close rays, which give to it the characteristic and prized silver grain, now economized by one or other of the modes of "quarter-sawing" in the mill. Such dimorphic medullary rays, however, are not limited to the oaks; nor are all oak woods marked by the crowding or exaggerated size of the vernal ducts, as may be seen in contrasting one of the deciduous species, like *Q. alba* (pl. 8) or *Q. Phellos* (pl. 8), with the southern live oak, *Q. virginiana*, or such a Californian species as *Q. chrysolepis* (pl. 9). Different as they are in this respect, though all agree in possessing the heavy medullary rays, and whether or not the ducts are larger in the spring wood, those of the later growth are characteristically distributed in a more or less branched and radially arranged "flamelike" wood-parenchyma pattern, and the medullary rays are joined, in cross section, by fine tangential bands of such tissue.

Though efforts have been made to differentiate the woods of the more important economic oaks by utilization of these characters, which are so marked in their extremes, it is questionable if they ever will be found sufficient for use except in the hands of experts and as a timber resort when other and more readily applied characters have been lost. The ducts of white oaks as a group are plugged by tyloses, which are sparingly, if at all, present in the red oaks. Other differences are shown in color, hardness, toughness, and permeability to fluid of the wood of different oaks; and the species differ greatly in the thickness of the new zone of wood laid on each year: but here, too, variation is so great and transitions are so gradual that the differences are usable taxonomically only in a very general and qualified way. For the usual species of the eastern United States, they are pictured by Hough, whose published actual sections of American woods furnish material for the illustrations of a few such types that are given here.

TWIGS.

When without foliage in winter our northern oaks are distinguished readily from other woody plants by their commonly fluted twigs with five-angled continuous pith, alternate transversely half-round or irregularly elliptical leaf scars with a number of scattered bundle traces, minute stipule scars, and, especially, by the clustering of the leaf scars and the rather uniform sessile scaly buds toward the end of the season's growth. In stoutness, color, prominence of lenticels, and pubescence, the twigs of the several species differ greatly and those of a given species agree fairly well among themselves except for the changes that come with age as the pubescence fades or falls, the epidermis flakes away, etc. Though descriptions of material may not prove to have seized the twig characteristics of the species in every case because of immaturity of available specimens, and fresh mature twigs undoubtedly will give opportunity for color corrections and additions, an effort has been made here to indicate the twig characters with the greatest possible accuracy in every case. Though it affords no

taxonomic character, mention should be made of the fact that like poplars, elms, etc., though to a lesser degree, the oaks illustrate the phenomenon of "self-pruning," or the fall of weaker branchlets through abscission at a winter node or juncture.

BUDS.

The fully matured winter buds are generally very characteristic. Oersted insisted on this, and Engelmann pointed out some of its applications, a generation ago; one of my graduate students, Miss Cobb, and I have applied it with some precision to the oaks of the Eastern United States; and I have made use of it in my little manual, Winter Botany. If the bud descriptions in the following pages should not be found always to conform to the facts in the most characteristic way, my excuse must be that many descriptions have been drawn of necessity from herbarium specimens of unlike development so that equal maturity had not been reached in all. In color, mature buds of different species range all the way from light straw or clay color through buff and soft brown to a rich red; their surface may be absolutely glabrous or the scales may be ciliate or persistently silky or tomentose; and in shape they give the entire series between globose, ovoid, conical, and somewhat fusiform, with flattened or grooved sides in some instances. On vigorous shoots axillary buds are accompanied sometimes by collateral accessories in many species of both red and white oak.

STIPULES.

A very marked difference is found between the mature buds, especially those clustered at end of the twigs, of certain oaks like *Q. macrocarpa*, *Q. insignis*, etc., on the one hand, and *Q. alba* on the other, in that the former are flanked by narrow elongated stipules. As a character, this persistence of the stipules is undoubtedly of greater value than I have been able to give it in the following descriptions, in some of which, no doubt, where persistent stipules are noted fully matured material would have shown them to have fallen, as they do in most of our northern oaks. No American species show such an aggregation of unmodified stipules outside the broader bud scales as is seen in *Q. Cerris* of the Mediterranean region. On theoretical grounds, Schotkey considers persistence of stipules to be characteristic of the more primitive groups.

VERNATION.

As Engelmann has pointed out, the disposal of the young leaves in the buds of oaks differs greatly when different species are compared. The differences are often seen easily when the buds are unfolding. They comprise a series ranging from merely concave, through a modification in which the margins are slightly outcurved, into strongly revolute on the one hand and conduplicate on the other. Of the species that have been studied, the white oaks agree pretty constantly in having folded or conduplicate leaves in the bud, the folding less complete in *Q. stellata* than in others; but in the exceptional Californian *Q. dumosa* they are somewhat revolute, and in the still more aberrant group of live oaks of which *Q. virginiana* is the type they are very revolute. More or less conduplicate as to the innermost leaves of a number, they are concave or flattened in most of our eastern black, scarlet, and water oaks and in the broad-leaved Californian black oak, but revolute in the eastern willow oaks and in the western olive and holly oaks. Engelmann has indicated that in a few cases the tips of the lobes of these black oaks are inflexed in vernation.

LEAF.

The simple leaves, usually of moderate size though exceptionally very large in *Q. macrophylla* or very small in *Q. striatula*, *Q. Toumeyi*, etc., and ranging from nearly linear to nearly orbicular in form, are characteristically stalked, and it is only by way of emphasizing a contrast that those in which the petiole is shortest may be spoken of as subsessile.

PETIOLE.—The petiole, whether long or short, is round or transversely elliptical in section, often with a suggestion of winging above, from the slightly decurrent margins of the blade. The numerous vascular bundles that enter its base from the trilacunar node blend as they pass

upward, so that at the middle the petiole contains a single somewhat three-sided curved bundle consisting of phloem on the outside and xylem within, encircling the central mass of medullary parenchyma and sheathed on the outside by a sclerified white pericycle between which and the epidermis lies the rather thick cortical parenchyma. In our common deciduous oaks this vascular ring is reinforced by an inner transverse plate with xylem facing ventrally and phloem dorsally, lying in the medullary parenchyma, a circumstance apparently not connected with the obvious taxonomic differences of the species, since the structure is comparable in both white and black oaks; but it has been pointed out by Bosseboeuf that this inner strand of xylem and phloem is characteristically absent from a number of evergreen oaks.

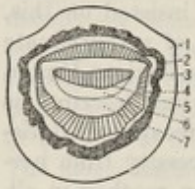


FIG. 1.—Deciduous oak petiole (Q. *palustris* ×25).

MARGIN.—One accustomed to the oaks of northern countries, on either continent, naturally thinks of them as having deeply lobed leaves, the lobes rounded and with rounded sinuses in European and many American species, but in North America occurring quite as often with sharp bristle-tipped segments and sometimes acute sinuses. Some of those of northern Asia are serrate as are some of the temperate American species, and a small number of the latter are entire. A glance through the accompanying plates will show that very few of the tropical American species are deeply lobed, and that many of them are entire. Most oak leaves are toothed in one way or another, and when entire they may be mucronate if not artistate from the midrib or the tips of the primary veins.

VEINING.—As Oersted has indicated, the veining of the leaves presents several distinct types, especially in meshing and looping; but the differences are not easily expressed in a few words, and they undergo such marked changes between lobed and entire leaves—often of closely related species or of forms of a single polymorphic species—that I have not found it possible to rely on them to any considerable extent. It is to be noted that this is one of the most utilized characters in the description of fossil leaves, and von Ettingshausen has made it the subject of extended comparative studies, illustrated by his unequaled type of nature prints.

More practically available than their direction and branching is the elevation or depression of the veins on the surface. A number of groups of the dry Tropics are well marked in having their veins sunken below the upper leaf surface, either wholly—when they are spoken of as reticulately impressed or rugose—or as to the branches of the midrib when the term pinnately impressed has been applied to them. On the lower surface, and in many species on the upper face as well, the veins are generally prominent. Relatively few species have such thick and firm leaves that the veins are neither impressed nor raised above the surface. To a certain extent the number of principal veins and the angle that they form with the midrib are characteristic, but neither feature has seemed to me to possess sufficient constancy to make its use very dependable in contrasting closely related species.

PUBESCENCE.—Though many of the oaks are hairy as they develop from the bud, a very large number of them become nearly or quite glabrous as their several parts mature. This is particularly true of the upper leaf surface, so that the persistence of scattered short stiff hairs on the upper face of the leaves assumes importance for the recognition of such species as *Q. stellata* (pl. 10), as the velvety coating of the upper surface does for such groups as the Chihuahuenses. The lower surface retains its pubescence much more commonly. The Virentes, Scytophyllae, and Crassifoliae, for instance, not only exemplify this fact, but illustrate extreme types of such hairiness; and the Arizonicae and Furfuraceae present other and different illustrations. Where the pubescence normally falls, as the leaves mature, its disappearance is not always or uniformly complete. Vestiges are to be expected in sheltered places, such as the groove along the midrib above or the sides of the midrib and main veins beneath; and in many species (*e. g.*, *Q. palustris*, pl. 10) characteristic tufts of brown hairs—the acaro-domatia of Lundstrom—persist in the axils of the veins on the lower surface of the leaf. Such hairs, like all of the oak trichomes except for a few septate glandular hairs, are finally thick walled, not septate, and stellately tufted or sometimes somewhat peltately connate: as Engelmann has pointed out, these are the "golden scales" of the Californian *Q. chrysolepis*.

A number of species of Leucobalanus, notably *Q. bicolor*, *Q. lyrata*, and *Q. Durandii*, occur both in a more xerophytic form, which is white-tomentulose beneath, and a more mesophytic form, usually in the woods, which is green and merely velvety on the lower surface.

STRUCTURE.—Nothing that seems really applicable for the differentiation of species has been observed in the anatomy of the foliage, though it is possible that further comparative study may reveal characteristic differences, and some students have thought these to exist. The ordinary oak leaf is surrounded by a single epidermal layer, and its mesophyll consists of one or two layers of palisade cells and a moderate spongy parenchyma through which the vascular strands run. The more xerophytic types possess a heavier epidermis and more highly developed palisade tissue, but the structure varies so greatly between exposed and shaded leaves even on individual trees as to indicate little more than the pliability of leaves in their reaction to environment. In this respect oaks have been shown by Hanson to resemble numerous other kinds of trees.

SURFACE.—Some few species have the upper surface raised between the fine impressed veinlets, but it can not yet be said whether this occurs constantly and characteristically in the species that show it. Though not always the case, it is generally found that leaves with dense tardily deciduous tomentum on the lower surface are similarly but more prominently bullulate-granular beneath; examples are offered by the groups Mexicanae, Tristes, and Reticulatae.

COLOR.—Experience with common oaks shows that their mature foliage, usually paler beneath, grades above in different species from very dark green to a distinctly bluish shade; and what is known of our Southwestern species warrants the conclusion that, accurately applied in the field, this offers a very important diagnostic character. Occasionally the salient veins are neatly contrasted with the lamina in color—white in *Q. maxima*, red in *Q. haematophlebia*, etc.—and it is probable that much more can be made of such differences than one feels safe in stating from herbarium indications. Some few species, like the Crassifoliae when denuded, the Guatimalenses, Parviglandes, etc., are distinctly whitened beneath without being actually glaucous; others, like *Q. maxima*, possess a very faint and easily removable bloom on the lower surface; others are more distinctly and lastingly glaucous; and in the Oblongifoliae, etc., the petioles are rather heavily waxen-pruinose.

It is a matter of common observation that familiar species of oak may be distinguished at a distance, either singly or massed, by the color of their expanding foliage. The developing leaves of *Quercus palustris* are green and those of *Q. maxima* quickly assume this color, though, as in *Q. macrocarpa* and *Q. velutina*, they are of almost a silvery gray for a time; and on *Q. alba*, *Q. coccinea*, *Q. ellipsoidalis*, etc., they are of some shade of red, as is also the case with the foliage of suckers of *Q. velutina*, etc. In autumn the fading leaves also assume such characteristic colors as to have led *Q. coccinea* to be called scarlet oak and to have induced Bartram to apply the name *Q. flammula* to what is known now as *Q. laevis*. Unfortunately for its taxonomic applicability, this seasonal reaction is too greatly dependent on individual peculiarities and regional or even strictly local environment to be constant. An illustration of this point is afforded by the unsuccessful efforts of so excellent an observer and botanist as Mr. Hill to use autumnal coloration as a distinguishing mark between *Q. ellipsoidalis* in its typical form and its rounder fruited form which he mistook for *Q. coccinea*.

PERSISTENCE.—It is a matter of common observation that although they are killed by autumn frosts, the leaves of most northern oaks stay on the trees into or through the winter, as do those of the related beeches. In the Southern States the winter oaks are distinguished from others by remaining green after their congeners have faded, and the English oak is conspicuous in this respect when planted among our own white oaks. Several of the laurel oaks hold their foliage fresh until the new leaves appear. In contrast with these, which have only one season's foliage fully functioning at any given time, the live oaks afford examples of true evergreens, with two seasons' leaves active at once.

It may not be possible to explain the persistence of the leaves of Fagaceae—even though dead—as a trait derived from tropical ancestry, as Werner Magnus has suggested. Such

ancestry except at a very distant period is questionable; and Fagaceae are among the trees which possess very well-protected winter buds—the terminal bud developed early in the season and persisting. The applicability of leaf duration in taxonomy is equally questionable because of the overlapping of the fully deciduous and partly evergreen types, quite justifying Schottky's contention for a sharp differentiation between these and the truly evergreen or perennial leaves. Though an effort has been made to indicate the facts shown by herbarium material in this respect, I am satisfied, from my experience with *Q. brachystachys*, *Q. callosa*, and other Guatemalan species, that a large number of those that are here called evergreen have their foliage persistent merely till the end of the dormant period; and the ready response of the oaks to alternations of heat and drought with cool rainy periods during the spring—leading to three, or in one instance, as Mr. Lauterbach has shown me, five cessations and renewals of growth in a single season of this character—can but cast doubt on herbarium indications as to the biennial persistence of both leaves and fruit on what looks like two years' growth. Heterophylly frequently attends such growth renewals.

INFLORESCENCE.

It is characteristic of the Fagaceae that their simple flowers are monoecious and, at least the staminate, in catkins or very condensed compound spikes. As with the Juglandaceae, the pistillate flowers appear on the new growth of the spring, but the staminate flowers are partly developed from buds of the preceding season without accompanying leaves. The staminate catkins are commonly elongated. At comparable stages of development they seem to afford characters by which some species can be distinguished, but the general practicability of this is scarcely evident as yet. The pistillate inflorescence is usually smaller and always fewer flowered than the staminate. Not seldom it is reduced to one or two nearly sessile flowers; but every degree of elongation of the peduncle—frequently continuing as the fruit matures—is to be found up to such cases as that afforded by *Q. Barbeyana*, and such lengthened peduncles often bear one or more additional clusters of flowers, or are somewhat uniformly floriferous for a considerable distance as in *Q. decipiens* and *Q. Urbani*. Though the development of the pistillate peduncle is variable within small limits in most species and shows a considerable range in some cases, *e. g.*, *Q. alba*, the degree of stalking is often characteristic, and extreme lengthening of the fruiting peduncle usually affords a good specific or group character. A belief that the characteristic cup of the pistillate oak flower is constituted by the fused secondary branches of a dichasium receives indirect support in the occasional production of acornlike galls in the axils of its scales, as well as in place of normal buds.

FLOWERS.

The flowers themselves are very simple, always with scarious perianth and, except for monstrosities, unisexual, but I can scarcely consider them as primitively simple or imperfect or even axifloral. Judging from frequency of appearance of their parts when staminate, they might be considered as either trimerous or pentamerous with almost equal probability of correctness; but, as is usual in simplified anemophilous flowers of this sort, the parts vary in number to a distracting extent. That the flowers are imperfect through reduction is evident from the appearance now and then of a very rudimentary pistil in essentially normal staminate flowers; and in certain Asiatic forms, sometimes taken as representative of Quercus and sometimes segregated from that genus, these pistil vestiges are more evolved so that the flowers sometimes appear to be perfect. Association of the sexes sometimes comes also from the development of stamens from minute rudiments that are present in normally pistillate flowers. Reconstruction of a floral diagram from the comparative data afforded by both staminate and pistillate flowers would indicate the flowers as typically trimerous, with double perianth and androecium whorls, regularly alternating with the three carpels—a suppressed inner whorl of 3 alternating with these and opposite the inner segments of the perianth being assumed by Berridge.

PERIANTH.—Though the number is not constant, the segments are often six. They are variously and somewhat unequally united in staminate flowers but, where free, distinct in pistillate flowers. A comparison of staminate flowers of white oaks with those of black oaks growing about Cornell University, made by Professor Rowlee and Miss Nichols a number of years ago, shows strikingly that the former collectively have far more deeply separated perianth segments than the latter, and this is in general though not complete agreement with what is shown in icones of the genus; still, at present, the availability of this character for the differentiation of species appears questionable. The perianth of the pistillate flowers is scarcely more usable in taxonomy than that of the staminate flowers. It is adherent up to the base of the separated styles and apparently typically of six leaves, which are in two alternating sets—a fact that has to be assumed in the staminate flowers.

STAMENS.—The number of stamens in the oak flower is even more variable than that of the perianth segments. Though it appears to be six typically, it often deviates from this number, oscillating closely about this standard in the black oaks but reaching nine in the white oaks. Though a decided difference is observable sometimes between the flowers of different species in the relative length of anther and filament and of filament and sepal, so that the anthers are more exserted in some cases than others, the length of the filaments increases enough during anthesis to make it difficult now for one to feel confidence in its taxonomic applicability.

The size and form of the anthers seem capable of utilization in distinguishing between at least groups of species when consistently and accurately applied. As a rule the slightly versatile or almost innate extrorse anthers are scarcely notched and with distinctly apiculate connective in the black oaks, and distinctly notched and with smaller connective tip in the white oaks, though they are scarcely to be understood as characteristically so oblong-elliptic in outline in the latter and acutely ovoid in the former as might be inferred from an examination of the exquisite illustrations in Professor Sargent's Silva. In this *Q. lyrata* forms the only exception to such a generalization among the white oaks, though *Q. agrifolia, rubra, georgiana, imbricaria, velutina, laurifolia, nana, nigra, palustris,* and *maxima* would be said to be rather of the white-oak form, as also, except for a greater apiculation, *Q. laevigata, imbricaria,* and *Phellos*. The anthers further differ in size to a measurable extent when different species are compared, *e. g.*, 0.5–0.75 mm. in *Q. cinerea;* 0.75–1 mm. in *Q. maxima;* 1.2–1.5 mm. in *Q. callosa;* 1.2–1.8 mm. in *Q. brachystachys*. Still, none of these differences appears to be applicable to the delimitation of species in the present state of our knowledge.



FIG. 2.—Extrorse androecium (Q. *macrocarpa* ×10).

Engelmann called attention to the fact that while the anthers of oaks are glabrous in most cases, they are characteristically hairy in *Q. stellata* and *Q. virginiana*. Professor Sargent has shown that this is true further of Q. *Chapmani* and what is taken for a hybrid of *Q. alba* and *Q. stellata;* and it is characteristic of *Q. Boyntonii*. The pubescence of the anthers of *Q. virginiana,* which proves common to all of the Virentes, had been pictured earlier by Oersted. This character, likewise shown in the aberrant European *Q. Cerris,* has been given attention in my own study, and further instances of anther pubescence among the white oaks are noted in the descriptions that follow of *Q. barbanthera, Q. centralis, Q. deserticola, Q. glaucoides, Q. laxa, Q. macrophylla, Q. magnoliaefolia,* and *Q. Martensiana*. In three closely related black oaks only, *Q. salicifolia, Q. acapulcensis* and *Q. tahuasalana,* have hairy anthers been observed.

PISTIL.—At the time of flowering the pistil is barely more than the three styles and their stigmas. The perianth consists normally of six distinct perianth segments surrounding the bases of the styles like an erect collar. Below the insertion of the perianth a short stylopodium has developed; this consists essentially of the coherent bases of the three styles, and as yet the ovary is indicated by at most a small separation of the carpel bases. It is this stylopodium, crowned by the perianth, which persists as a solid beak at top of the mature acorn. In the annual-fruited white oaks the perianth collar is quickly carried above the forming cup, but in the biennial-fruited red oaks this elongation does not occur until fertilization has been effected in the second season; and in these oaks the collar is grooved below annularly and the cup scales

interlock with it, thus giving added protection during the first season to the dormant pollen tubes which apparently use the stylopodium as a hibernaculum. The later lengthening of the ovary and the intrusion into its cavity of three two-ovuled placentae which are at first parietal, render it essentially three celled with an axile placenta at one stage, though its further enlargement as the usually solitary seed develops more or less completely obliterates this structure and leaves it distinctly one celled at maturity.

Oersted had laid great stress on the importance of the stigma in the classification of oaks, though it affords a character common to groups of species rather than peculiar to species themselves. Since the stigmas persist on the fruit, they often afford a dependable indication of the group to which a specimen with partly developed acorns belongs, when other characters may be less convincing.



FIG. 3.—White Oak Gynaecim (Q. *macrocarpa* ×5).



FIG. 4.—Red Oak Gynaecium (Q. *imbricaria* ×25).



FIG. 5.—Ovary and Cupule (Q. *macrocarpa* ×5).

As it is limited now, the genus Quercus differs on this continent from other Fagaceae in a spatulate dilatation of the stigmas, this enlargement being broad, abrupt, and spreading in the white and intermediate oaks, and gradual on the longer outcurving styles of black oaks.

FRUIT.

Notwithstanding the great diversity of oak fruits, the most striking fact about them is that, constantly for each species, they mature in the course of the first season in all of the white oaks, so far as known for America, while in by far the larger number of cases they require two years for development in the black oaks. As has been shown by Hofmeister as early as 1858, and later by Conrad, the biennial-fruited species await fertilization for an entire year after being pollinated, so that the actual period of fruit maturation is the same in all cases. It is so simple a matter to observe whether a tree in autumn bears undeveloped pistillate flowers on the present season's growth and mature fruit on that of the preceding year, or ripe fruit only and this on the growth of the year, that this character is usually ascertained with certainty; and yet many herbarium specimens of tropical oaks are questionable in this respect for several reasons, and it is quite possible that some of the closely related black oaks that have been differentiated principally on apparently annual or biennial fruit ripening are not really separable even in this respect.

CUP.—A special feature of the oak fruit, which experience shows to afford one of the most constant and dependable characters for these plants, is the cup that surrounds the base of the acorn. In the American species it is always covered by distinguishable, if sometimes modified, scales—sometimes, as in *Q. lyrata*, etc., fused at base. The foliar nature of these has been argued from their occasional teratological replacement by leaves.

Formed with the pistillate flower, the cup grows with greater rapidity for a time, so that the partly developed acorn is inclosed in it except for its tip. This condition persists to maturity in *Q. lyrata;* but it is not to be considered characteristic for a number of species in which, because

of immaturity of specimens, it has been figured or described. Ordinarily the elongation of the cup stops long before the fruit is fully grown, and at maturity it rarely covers more than the lower fourth or third of the acorn.

Though the cup varies as greatly as the acorn does in a few species such as *Q. macrocarpa*, it is usually reasonably constant for a species, but it differs for different species or groups. A few representative extremes may be seen in *Q. cyclobalanoides*, *Q. insignis*, *Q. macrocarpa*, *Q. lyrata*, *Q. maxima*, *Q. velutina*, *Q. chrysolepis*, and *Q. invaginata*. Apart from depth and shape, the cup differs in the shape, thickness, and appression of its scales—which are more commonly blunt, appressed, and thin in the black than in the white oaks; and in their glabrousness or in a pubescence—culminating in the golden tomentum of *Q. chrysolepis*. Though distinct for the most part, the scales are more or less fused in some species and obscure in others, the latter condition reaching its extreme in *Q. cyclobalanoides* in which they form connate rings with only the individual tips free. In some species, *e. g.*, *Q. laevigata*, *Candolleana*, *crassipes*, *planipocula*, *Rosei*, etc., and especially in the curious *Q. invaginata*, the cup is characteristically widened beyond the diameter of the acorn and inrolled against it—a good character when properly used, but liable to prove misleading if overemphasized, since the uppermost scales of the cup are found to be inrolled sometimes in species which do not show this feature characteristically. Perhaps taxonomic attention should be given to the color of the large scar from which the ripe acorn has fallen, which is bright orange in *Q. stellata* and what is called *rubra* now and, like the entire inside of the fresh cup, lemon yellow in *Q. ellipsoidalis* and *Q. velutina*, etc., white in *Q. alba*, and dingy in *Q. nigra*, etc.: but herbarium material can not be depended on to decide this point.

ACORN.—Usually, as in other groups, the size, shape, color, texture, and glabrousness or pubescence or glaucousness of the ripe fruit is characteristic here, but in a few cases enormous differences are known in fruit without correlation with other characters; and even to-day so large a part of the evidently distinguishable oaks are known through sterile or immature material only, and so many others were characterized originally from such material, that full diagnostic utilization of their fruit remains for the future. Even readily observed differences, for instance in thickness and hardness of the shell, the intrusion of thickened vestiges of the placental septa, etc., are commonly of too intergrading a character to be of much use. Though a longitudinal striping of the fresh acorn is often very marked in species like *Q. palustris*, *Q. ellipsoidalis*, and *Q. Engelmanni*, it is too transient for general application.



FIG. 6.—Red Oak Acorn (*Q. palustris* ×2).

Two very neat characters of general applicability are presented by the mature acorn. Its wall, next the delicate seed coat, is found to be very woolly in all of the black and intermediate oaks and glabrous or at most a little silky in all of the white oaks, of which fruit has been examined. Except for a few aberrants, this difference in the inner surface of the shell, correlated also with differences in anthers, stigmas, etc., goes with an ovule character likewise pointed out by de Candolle, the presence of five abortive ovules (for as a rule only one of the six matures in a pistil) at or near the top of the seed in the black oaks and at or near its bottom in the white oaks. In the intermediate oaks, centering about *Q. chrysolepis*, though the tomentose interior of the acorn and its biennial maturation are as in black oaks, the basal abortive ovules and broad stigmas are as in the white oaks; and in a very few black oaks like the Durifoliae, Scytophyllae, Hypoleucae, and Costaricenses, the abortive ovules instead of being apical are basal or deeply lateral or distributed from top to bottom of the seed.

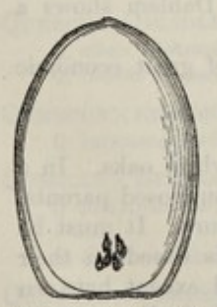


FIG. 7.—White Oak Acorn (*Q. alba* ×2).

EMBRYO.—Far too little attention has been given to the embryo in taxonomic studies. At present it can be said only that the cotyledons differ much in astringency and in color, and that in a few white oaks, constituting his group Macrocarpaea and possibly representing an ancient and not a modern type, Oersted shows the usually axile radicle to be oblique. A deep grooving of the cotyledons by the intrusion of septal ovarian

ridges in some tropical black oaks and a slighter but distinct manifestation of the same sort in our northern black oaks, may merit more attention than has been given it; and the otherwise aberrant live oak of our Gulf region has connate cotyledons, as Engelmann pointed out many years ago,—a character also ascribed to *Q. arizonica* by Sargent.

SEEDLINGS.—In the (frequently atavistic?) foliage of seedlings there is so much inconstancy and so little relative comparability with mature foliage of the same species that it appears distracting to introduce the little that is actually and accurately known about oak seedlings into a monograph which aims primarily at making it possible to ascertain the proper names of the species in their adult form; but such studies are important in themselves, and it is possible that they may afford clues to relationship that are now lacking.

ABNORMALITIES.

TERATOLOGY.

Apart from the heterophylly between the younger or infertile and the mature growth of many species and sometimes traceable between the successively unfolded leaves of a season's growth, which is to be considered rather an indication of variability and which shows itself occasionally in persistent mutations like that of the heterophyllous white oak and the manifold horticultural forms of the species of northern Europe, few foliage monstrosities are found in this genus. The most noteworthy is a doubling of the blade, apparently of *Q. Phellos*, by which the Pleistocene *Q. abnormalis* is characterized. In flowers and fruit deviations from type appear to consist in variation, replacement or suppression of normal structures, etc., and a not infrequent occurrence of more than one seed in the acorn is attributable to the development of more than the customary one out of the six ovules normally present in an ovary. Exceptionally, an infertile pistillate flower is found elongated into a budlike body 15 or 20 mm. long, on which the usual cupule scales are imbricated. An unusual anomaly for what are considered lower Apetalae is the occurrence of two embryos within a single nucellus, reported by Harvey (Ann. Rept. Mich. Acad. Sci. vol. 19, p. 329, 1917.)

GALLS.

Few plants are so variously and so characteristically deformed by gall insects as are the oaks, and the constancy and symmetry of reaction of the tissues of the plant to the irritation of the insect furnish food for much reflection on the reasons for characteristic constancy in plant form. Perhaps the most striking of such deformities is that in which the galls simulate acorns in form and texture, *e. g.*, in those occurring on the outside of the cup of certain of our white oaks noted by Engelmann and attributed by Riley to *Cynips Quercus glandulus*,[3] and those developed from buds on some of the European oaks as a result of the attacks of *C. fecundatrix*. One specimen of the South American *Quercus tolimensis* at Dahlem shows a similar acornlike gall replacing an axillary bud.

Because of their large tannin content, a number of the oak galls are of great economic importance.

HYBRIDITY.

Many observers have collected or reported what they have taken for hybrid oaks. In a few instances these do not appear to be more than extremes of one of the supposed parents, but most such specimens which I have examined seem to be of hybrid nature. It must be admitted that little actual evidence exists to support this opinion, which is based on their appearance. So far as my knowledge goes, no hybrids have been detected except between parents of a single subgenus,[4] though supposed crosses of the aberrant red oak *Q. Emoryi* with the white oaks *Q. grisea* and *Q. pungens* are reported. Within the subgenera, crossing is usually between rather closely related species; but this is not always true, especially in the

[3] This gall, among others, is figured by Felt in a comprehensive illustrated key to American insect galls (Bull. 200, N. Y. State Museum, in which oak galls occupy pp. 52–119.)

[4] In contrast with this, Houba (Chênes. p. 88) reports the red oak as grafted on English oak, and Hall gives an account of a supposed natural graft between *alba* and *velutina*.

case of the red or black oaks. Perhaps the most remarkable of all oak hybrids is ×*Q. Comptonae*, referred to under the species from which it has been produced artificially—one of them the ubiquitous live oak of our Gulf States, the most aberrant of existing white oaks. The tropical species are not known as yet to hybridize, but there is no evident reason why they should not do so. For the United States, 51 hybrids are admitted.[5] Usually in characters these are intermediate between their assumed parents; but attention is called below to a tree of ×*Q. Bebbiana* which is scarcely distinguishable from *Q. macrocarpa* except in its fruit and germination, which are quite as in *Q. alba*.

LIST OF AMERICAN HYBRIDS.

QUERCUS ×ANDREWSII Sargent. (*Q. macrocarpa* × [?]*undulata*.)

Q. Andrewsii Sargent, Bot. Gaz., vol. 65, p. 455. 1918.

QUERCUS ×ARKANSANA Sargent. (*Q. marilandica* × *nigra*?.)

Q. [*marilandica*] *nigra*×[*nigra*] *aquatica* Ashe, Journ. Elisha Mitchell Sci. Soc., vol. 11, p. 92. 1894.
Q. arkansana Sargent, Trees & Shrubs, vol. 2, p. 121, pl. 152. 1911.
Q. sp. Harper, Bull. Torrey Bot. Cl., vol. 41, p. 209, 214, f. 3. 1914.
Q. sterilis Trelease, Proc. Amer. Phil. Soc., vol. 56, p. 51. 1917.

That the "pocosin" oak of Alabama and Florida, referred to and figured by Mr. Harper, is not a hybrid, is not very closely related to *Quercus marilandica*, and is not the same as anything that grows in Arkansas, is firmly believed by Mr. Harper, who wrote me in 1921 that while it resembles *Q. marilandica* in leaf outline it "differs from it in bark, acorns, absence of rusty tomentum on the leaves, and in nearly everything else. It comes as near being an overgrown form of *Q. myrtifalia* as anything I know of." He notes further that while hybrid oaks occur as solitary individuals in proximity to both parents, this is fairly abundant in its limited area and its habitat is quite different from that of *Q. marilandica* which does not grow very close to it in Alabama and is hardly to be expected in western Florida where Veatch recently has found the same form.

QUERCUS ×ASHEI Trelease. (*Q. cinerea* × *laevis*.)

Q. cinerea×*Catesbaei* [*laevis*] Ashe, Journ. Elisha Mitchell Sci. Soc., vol. 11, p. 88. 1894.—Small, Bull. Torrey Bot. Cl., vol. 22, p. 76, pl. 234–5. 1895.
Q. brevifolia [*cinerea*]×*Catesbaei* [*laevis*] Sudworth, U. S. Dep. Agr., Div. Forestry Bull. 14, p. 170. 1897.
Q. Ashei Trelease, l. c., p. 48. 1917.

QUERCUS ×ATLANTICA Ashe. (*Q. cinerea* × *laurifolia*.)

Q. laurifolia×*cinerea* Ashe, Journ. Elisha Mitchell Sci. Soc., vol. 11, p. 89. 1894.
Q. atlantica Ashe, Proc. Soc. Amer. Foresters, vol. 11, p. 88. 1916.
Q. sublaurifolia Trelease, *l. c.*, p. 52. 1917.
Q. dubia Sargent, Bot. Gaz., vol. 65, p. 452. 1918, in part.

QUERCUS ×BEADLEI Trelease. (*Q. alba* × *Prinus*.)

Q. alba× *Michauxii* [*Prinus*] Britton & Shafer, N. A. Trees, p. 343. 1908.
Q. Beadlei Trelease, *l. c.*, p. 48. 1917.

QUERCUS ×BEAUMONTIANA Sargent. (*Q.* [*laurifolia*] *rhombica* × *rubra*.)

Q. beaumontiana Sargent, Bot. Gaz., vol. 65, p. 451. 1918.

QUERCUS ×BEBBIANA Schneider. (*Q. alba* × *macrocarpa*.)

Q. alba×*macrocarpa* Engelmann, Trans. Acad. Sci. St. Louis, vol. 3, p. 398. 1877.—Sargent, Silva, vol. 8, pl. 360.
Q. Bebbiana Schneider, Ill. Handb. Laubholzkunde, vol. 1, p. 201. 1904.

QUERCUS ×BENDERI Baenitz. (*Q. coccinea* × *rubra* [*maxima*].)

Q. Benderi Baenitz, Allgem. Bot. Zeitschr., vol. 9, p. 84. 1903.

Subdivided into *Q. Benderi coccinoides* and its f. *volvato-annulata*, and *Q. Benderi rubroides*.

[5] These form the subject of a paper published in the Proceedings of the American Philosophical Society (vol. 56, p. 44, pl. 1–3), in which I have proposed binomials for those which had not been so named previously; and a later publication, by Professor Sargent in the Botanical Gazette (vol. 65, p. 423), which adds 11 to the 40 hybrids earlier named.

Quercus bernardiensis Wolf = Q. Fernowi.

QUERCUS BLUFFTONENSIS Trelease. (*Q. laevis* × *rubra.*)

Q. Catesbaei [*laevis*] × *falcata* [*rubra*] Mellichamp, 1893, in U. S. Nat. Herb.

Q. blufftonensis Trelease, *l. c.*, p. 48. 1917, name only.

Twigs and buds glossy red-brown, glabrous. Leaves thin, venulose, glabrous or with small axillary tufts beneath, oblong to lanceolate, mostly unequally 3 or 5 lobed; fruit biennial, with rather umbonate gray-pubescent cup and round-ovoid acorn about 12 × 15 mm.—Bluffton, S. C. (*Mellichamp*, August and October, 1893, the type in the U. S. National herbarium—as *Q. Catesbaei* × *falcata*). Very like *Q. Mellichampi* except for its larger and thinner leaves.

QUERCUS × BRITTONI Davis. (*Q. ilicifolia* × *marilandica.*)

Q. Brittoni Davis, Bull. Torrey Bot. Club, vol. 19, p. 301. 1892.

Q. ferruginea hybrida Dippel, Handb. Laubholzk, vol. 2, p. 111. 1893.

QUERCUS × BUSHII Sargent. (*Q. marilandica* × *velutina.*)

Q. Bushii Sargent, Bot. Gaz., vol. 65, p. 453. 1918.

QUERCUS × BYARSI Sudworth in litt. (*Q. macrocarpa* × *Prinus.*)

Q. Michauxii [*Prinus*] × *macrocarpa* Sudworth, Div. For. U. S. Dept. Agr. Bull., no. 14, p. 158. 1897.

QUERCUS × CADUCA Trelease. (*Q. cinerea* × *nigra.*)

Q. cinerea × *aquatica* [*nigra*] Ashe, Journ. Elisha Mitchell Sci. Soc., vol. 11, p. 90. 1894.

Q. caduca Trelease, *l. c.* p. 48. 1917.

QUERCUS × CAROLINENSIS Trelease. (*Q. cinerea* × *marilandica.*)

Q. cinerea × *nigra* [*marilandica*] Ashe, Journ. Elisha Mitchell Sci. Soc., vol. 11, p. 91. 1894.

Q. carolinensis Trelease, *l. c.*, p. 48. 1917.

QUERCUS × COCKSII Sargent. (*Q.* [*laurifolia*] *rhombica* × *velutina*— or *Phellos* ?.)

Q. Cocksii, Sargent, Bot. Gaz., vol. 65, p. 459. 1918.

QUERCUS × COMPTONAE Sargent. (*Q. lyrata* × *virginiana.*)

Q. Comptonae Sargent, Bot. Gaz., vol. 65, p. 459. 1918.—Ness, Journ. Heredity, vol. 9, pp. 263–268. f. 6–8. 1918.

QUERCUS × DEAMI Trelease. (*Q. alba* × *Muehlenbergii.*)

Q. alba × *Muehlenbergii* Britton & Shafer, N. A. Trees, p. 343. 1908.—Deam, Rept. Indiana Bd. Forestry, vol. 11, p. 127, pl. 44. 1912.

Q. Deami Trelease, *l. c.*, p. 48. 1917.

QUERCUS × DUBIA Ashe. (*Q. Phellos* × *velutina*—or *laevis.*)

Q. dubia Ashe, Journ. Elisha Mitchell Sci. Soc. vol. 11, p. 93. 1894.

Referred by Sargent, Bot. Gaz., vol. 65, p. 452, 1918, to *Q. atlantica* Ashe, which is held to be the same as × *Q. sublaurifolia* Trelease. The type collection is very like the entire leaved form of × *Q. Rudkini*, which it may represent. It is also the same as × *Q. bladenensis* Ashe in herb., held for a cross of *marilandica* and *cinerea*, and in this case of the same parentage as the published *Q. carolinensis*.

Quercus × Egglestoni n. hybr. (*Q. imbricaria?* × *Shumardii.*)

Very like × *Q. runcinata* but with thicker leaves, the clay-colored or reddish buds intermediate between those of *maxima* and *Shumardii*.—Litchfield, Ky. (*Eggleston, 5444*).

QUERCUS × EXACTA Trelease. (*Q. imbricaria* × *palustris.*)

Q. imbricaria × *palustris* A. Braun, Sitzungsber. Gesellsch. Naturf.-Freunde, Berlin, Dec. 20, 1870; Bot. Zeit., vol. 29, pp. 202–203.—Engelmann, Bot. Works, p. 405.—Daniels, Univ. Missouri Studies, Sci. ser. vol. 1, p. 265.—Shimek, Proc. Iowa Acad. Sci., vol. 15, p. 77, pl. 1–2.

Q. exacta Trelease, *l. c.*, p. 49. 1917.

Quercus × *falcata* Ashe = Q. subfalcata.

QUERCUS × FAXONI Trelease. (*Q. alba* × *prinoides.*)

Q. Faxoni Trelease, *l. c.*, p. 49. 1917.

Resembling *Q. alba* in its slender glabrous twigs, but with the fruit of *prinoides*, the oblanceolate-obovate glabrous leaves intermediate in lobing between the two.

Quercus × Fernaldi n. hybr. (*Q. ilicifolia × maxima.*)

Leaves dingy-tomentulose and with coarser axillary tufts beneath, shaped much as in *ilicifolia* or with about 4 falcate lateral lobes; fruit resembling that of *coccinea* but more persistently dingy-tomentulose.—Bedford, Mass. (*Fernald*, Oct. 4, 1908, as *Q. ilicifolia × velutina.*)

QUERCUS × FERNOWI Trelease. (*Q. alba × stellata.*)

Q. alba × stellata Vasey, Bull. Torrey Bot. Club, vol. 10, p. 25, pl. 29–30. 1883.—Engelmann, Bot. Works, p. 404.—*Q. alba × minor* [*stellata*] Sargent, Silva, vol. 8, pl. 359.

Q. Fernowi Trelease, *l. c.*, p. 49. 1917.

Q. bernardiensis Wolf, Torreya, vol. 18, p. 161. 1918.

QUERCUS × GIFFORDI Trelease. (*Q. ilicifolia × Phellos.*)

Q. Giffordi Trelease, *l. c.*, p. 49. 1917.

Leaves broadly lance-oblong, 2 × 5 to 9 × 14 cm., entire or variously sinuate or unequally or equally 3-lobed, canescent beneath.—May's Landing, N. J. (*Gifford & Peters*, July 11, 1890, in the herbarium of the New York Botanical Garden, as *Q. Phellos × ilicifolia*).

QUERCUS × GUADALUPENSIS Sargent. (*Q. macrocarpa × stellata.*)

Q. guadalupensis Sargent, Bot. Gaz., vol. 65, p. 454. 1918.

QUERCUS × HARBISONII Sargeant. (*Q. geminata × Margaretta.*)

Q. Harbisonii Sargent, Bot. Gaz., vol. 65, p. 458. 1918.

Quercus × Hastingsii Sargent. (*Q. marilandica* [?] × *texana.*)

Q. Hastingsii Sargent, Bot. Gaz., vol. 65, p. 450. 1918.

Apparently scarcely more than a form of *Q. texana.*

QUERCUS × HAWKINSI Sudworth. (*Q. borealis* [*maxima*] × *velutina.*)

Q. Hawkinsi Sudworth, Amer. Forestry, vol. 23, p. 683. 1917.

Scarcely differs from *maxima* except in its yellow cotyledons.

QUERCUS × HETEROPHYLLA Michaux, f. (*Q. maxima × Phellos.*)

Q. heterophylla Michaux, f., Hist. Arb. Amér., vol. 2, p. 87, pl. 16. 1812.—Gale, Proc. Nat. Inst. 1855, p. 70, f. 1.—Oersted, Chênes Amér. Trop., pl. B.—Houba, Chênes Amér. en Belg., p. 224, pl.—Sargent, Silva, vol. 8, pl. 436; Man. Trees, p. 248, f. 201.—Trelease, *l. c.*, p. 46.

Q. Phellos × coccinea Engelmann, Trans. Acad. Sci., St. Louis, vol. 3, p. 541. 1877.

Q. Phellos × rubra [*maxima*] Bush, Gard. & Forest, vol. 8, p. 379. 1895.

Q. palustris heterophylla Cockerell, Nature, vol. 66, p. 631. 1902.

Q. Hollickii Schneider, Ill. Handb. Laubholzk, vol. 1, p. 165. 1904. Not Berry, 1903.

QUERCUS × HILLII Trelease. (*Q. macrocarpa × Muehlenbergii.*)

Q. macrocarpa × Muehlenbergii Hitchcock, Bot. Gaz., vol. 18, p. 110–111, pl. 8. 1893.—Sargent, Silva, vol. 8, p. 56.

Q. Hillii Trelease, *l. c.*, p. 49. 1917.

Quercus × Hollickii Schneider = Q. heterophylla.

QUERCUS × JACKIANA Schneider. (*Q. alba × bicolor.*)

Q. Jackiana Schneider, Ill. Handb. Laubholzk., vol. 1, p. 202. 1904.

Q. alba × platanoides [*bicolor*] Alexander, Rep. Michigan Acad. Sci., vol. 6, p. 88. 1904.

Q. alba × bicolor Knowlton & Deane, Rhodora, vol. 16, p. 113. 1914.

QUERCUS × JOLONENSIS Sargent. (*Q. Douglasii × lobata.*)

Q. jolonensis Sargent, Bot. Gaz., vol. 65, p. 456. 1918.

Quercus × Joorii n. hybr. (*Q. rubra × Shumardii?.*)

Leaves much as in *Shumardii*, densely but denudably dingy scurfy beneath; buds rusty hairy, becoming blood red and glossy when abraded, in this as in the fruit resembling *Q. rubra.*—Galveston, Tex. (*Joor*, Sept. 25, 1884.)

QUERCUS × LEANA Nuttall. (*Q. imbricaria × velutina.*)

Q. Leana Nuttall, Sylva, vol. 1, p. 13,* pl. 5 bis. 1842.—Sargent, Silva, vol. 8, pl. 334.

Quercus × ***Lowellii*** Sargent. (*Q. borealis* × *ilicifolia?*.)

Q. Lowellii Sargent, Bot. Gaz., vol. 65, p. 459. 1918.

Perhaps rather only an aberrant form of *maxima* or *borealis*.

QUERCUS × LUDOVICIANA Sargent. (*Q. Pagoda* × *Phellos*.)

Q. ludoviciana Sargent, Trees & Shrubs, vol. 2, p. 223. 1913.

QUERCUS × MELLICHAMPI Trelease. (*Q. laurifolia* × *laevis*.)

Q. Catesbaei [*laevis*] × *laurifolia* Engelmann, Trans. Acad. Sci., St. Louis, vol. 3, p. 539. 1877.

Q. Mellichampi Trelease, *l. c.*, p. 50. 1917.

QUERCUS × MOREHA Trelease. (*Q. Kelloggii* × *Wislizeni*.)

Q. Morehus Kellogg, Proc. Calif. Acad. Sci., vol. 2, p. 36. 1863.—Greene, W. Amer. Oaks, pl. 2.—Sudworth, Forest Trees of Pac. Slope, f. 312.—Sargent, Silva, vol. 8, pl. 407.

Q. moreha Trelease, *l. c.*, p. 56. 1917.

Quercus × *Morehus* Kellogg. = Q. moreha.

QUERCUS × ORGANENSIS Trelease. (*Q. arizonica* × *grisea*.)

Q. arizonica × *grisea* Wooton & Standley, Contr. U. S. Nat. Herb., vol. 19, p. 171. 1915.

Q. organensis Trelease, *l. c.*, p. 50. 1917.

QUERCUS × OVIEDOENSIS Sargent. (*Q. cinerea* × *myrtifolia*.)

Q. oviedoensis Sargent, Bot. Gaz., vol. 65, p. 459. 1918.

QUERCUS × PALAEOLITHICOLA Trelease. (*Q. ellipsoidalis* × *velutina*.)

Q. palaeolithicola Trelease, *l. c.*, p. 50, pl. 1. 1917.

Quercus × *petiolaris* Ashe. = Q. podophylla.

QUERCUS × PODOPHYLLA Trelease. (*Q. cinerea* × *?velutina*.)

Q. petiolaris Ashe, Journ. Elisha Mitchell Sci. Soc., vol. 11, p. 90. 1894.—Not *Q. petiolaris* Benth.

Q. podophylla Trelease, *l. c.*, p. 51. 1917.

QUERCUS × PORTERI Trelease. (*Q. maxima?* × *velutina*.)

Q. Porteri Trelease, *l. c.*, p. 51. 1917.

Quercus × pseudomargaretta n. hybr. (*Q. Margaretta* × *stellata?*.)

Twigs gray bluff, stellate or glabrescent; buds glossy red; leaves rough stellate above, softly stellate beneath. Closely resembling *Q. Margaretta*.—Houston (*Fisher, 5116*), and elsewhere in Texas.

QUERCUS × REHDERI Trelease (*Q. ilicifolia* × *?velutina*.)

Q. ilicifolia × *?velutina* Rehder, Rhodora, vol. 3, p. 138, pl. 24, f. 1. 1901.—Knowlton & Deane, Rhodora, vol. 16, p. 113.

Q. Rehderi Trelease, *l. c.*, p. 51. 1917.

QUERCUS × RICHTERI Baenitz. (*Q. maxima* × *palustris*.)

Q. Richteri Baenitz, Allgem. Bot. Zeitschr., vol. 9, p. 85. 1903.

QUERCUS × ROBBINSII Trelease. (*Q. coccinea* × *ilicifolia*.)

Q. coccinea × *ilicifolia* Robbins in Gray, Manual, 5 ed., p. 454. 1868.—Engelmann, Bot. Works, p. 406.—Rehder, Rhodora, vol. 3, p. 139, pl. 24, f. 2.

Q. Robbinsii Trelease, *l. c.*, p. 51. 1917.

QUERCUS × RUDKINI Britton. (*Q. marilandica* × *Phellos*.)

Q. Phellos subimbricaria A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 63. 1864.

Q. Rudkini Britton, Bull. Torrey Bot. Club, vol. 9, pp. 13–14, pl. 10–12. 1882.—Sargent, Silva, vol. 8, pl. 437.

Q. subimbricaria Sudworth, Bull. U. S. Dept. Agr., Div. Forestry, no. 14, p. 179. 1897.

QUERCUS × RUNCINATA Engelmann. (*Q. imbricaria* × *maxima*.)

Q. rubra runcinata A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 60. 1864.

Q. runcinata Engelmann in Gray, Manual, 5 ed., p. 454, 1868; Trans. Acad. Sci. St. Louis, vol. 3, p. 542. 1877.

Q. hybrida Houba, Chênes Amér. en Belg., p. 310, pl. 1887.

Q. rubra ruminata Houba, *l. c.*, p. 85.

QUERCUS × SARGENTII Rehder. (*Q. montana* × *Robur* [*peduculata*].)

Q. Sargentii Rehder in Bailey, Standard Cyclopedia of Hort., vol. 5, p. 2886. 1916.

QUERCUS × SAULII Schneider. (*Q. alba* × *montana.*)

Q. alba×*Prinus* [*montana*] Engelmann, Bot. Works, p. 404.—Vasey, Bull. Torrey Bot. Club, vol. 10, p. 25, pl. 38.—Sargent, Silva, vol. 8, pl. 361.

Q. Saulii Schneider, Ill. Handb. Laubholzk, vol. 1, p. 203. 1904.

QUERCUS × SCHUETTEI Trelease. (*Q. bicolor* × *macrocarpa.*)

†*Q. hybrida Kentonii* Hampton, Rept. Ohio For. Bur., vol. 1, p. 194. 1886.

Q. macrocarpa×*platanoides* [*bicolor*] Alexander, Rep. Mich. Acad. Sci., vol. 6, p. 88. 1904.

Q. Schuettei Trelease, *l. c.*, p. 51, pl. 2–3. 1917.

QUERCUS × SMALLII Trelease. (*Q. georgiana* × *marilandica.*)

Q. georgiana×*nigra* [*marilandica*] Small, Bull. Torrey Bot. Club, vol. 22, p. 75, pl. 233. 1895.

Q. Smallii Trelease, *l. c.*, p. 51. 1917.

Quercus × *sterilis* Trelease = Q. arkansana.

Quercus × Sterretti n. hybr. (*Q. lyrata* × *stellata.*)

With the slender brown twigs, small rounded buds, and rather persistent upper stipules of *lyrata*, sparing persistent rather loose stellate pubescence beneath and roughish pubescence above, on the foliage, and obovate cuneate leaves variously sinuate or 3 or 5 lobed, the lobes in some cases large and square.—Little Rock, Ark. (*W. D. Sterrett, 6*, July 28, 1917, associated with *Q. lyrata*).

QUERCUS × SUBFALCATA Trelease. (Q. *Phellos* × *rubra.*)

Q. falcata Ashe, Journ. Elisha Mitchell Sci. Soc., vol. 11, p. 94. 1894.—Not *Q. falcata* Michaux.

Q. subfalcata Trelease, *l. c.*, p. 52. 1917.

A variety *microcarpa* of this is distinguished by Sargent, Bot. Gaz., vol. 65, p. 454, 1918.

QUERCUS × SUBINTEGRA Trelease. (*Q. cinerea* × *rubra.*)

Q. falcata subintegra Engelmann, Trans. Acad. Sci. St. Louis, vol. 3, p. 543. 1877.

Q. falcata [*rubra*]×*cinerea* Mellichamp, July, 1876, in Herb. New York Bot. Gard.

Q. subintegra Trelease, *l. c.*, p. 52. 1917.

Quercus × *sublaurifolia* Trelease = Q. atlantica.

Quercus × substellata n. hybr. (*Q. bicolor* × *stellata.*)

With rather shallowly lobed leaves gray-stellate beneath and sparsely roughened along the midrib above, in this character and the scurfy twigs resembling *stellata*.—Toms River, N. J. (*Percy Wilson*, July, 1916.)

Quercus × *Sudworthi* Trelease = Q. Willdenowiana.

QUERCUS × TRIDENTATA Engelmann. (*Q. imbricaria* × *marilandica.*)

Q. nigra tridentata A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 64. 1864.—Sargent, Silva, vol. 8, pl. 433.

Q. tridentata Engelmann, Trans. Acad. Sci. St. Louis, vol. 3, p. 539. 1877.

QUERCUS × WALTERIANA Ashe. (*Q. laevis* × *nigra.*)

Q. Walteriana Ashe, Proc. Soc. Amer. Foresters, vol. 11, p. 89. 1916.

Q. sinuata Engelmann, Trans. Acad. Sci. St. Louis, vol. 3, p. 400, 1877; Bot. Works, p. 404.—Sargent, Silva, vol. 8, pl. 418.

Held by Ashe not to be *Q. sinuata* Walter.

QUERCUS × WILLDENOWIANA Zabel. (*Q. rubra* × *velutina.*)

Q. velutina×*digitata* [*rubra*] Sudworth, U. S. Dep. Agr., Div. Forestry, Bull. 14, p. 171. 1897.

Q. Willdenowiana Zabel in Schneider, Ill. Handb. Laubholzk, vol. 1, p. 171. 1906.

Q. Sudworthi Trelease, *l. c.*, p. 52. 1917.

TAXONOMY.

AFFINITIES.

In common with the other amentiferous Apetalae, the Fagaceae, in which family the oaks fall, generally are assigned a position very near the base of the phylogenetic tree now currently accepted for Dicotyledons, and, with the Betulaceae, they constitute the order Fagales. There seems to be little question that they are affiliated with orders near which they are ranged in

recent books; but it is difficult to understand even on floral phylogeny the location of plants with definitely trimerous compound inferior pistils and exalbuminous seeds at the foot of a series the key to which is progressive departure from the hypothetical primitive flower.

In many respects the Fagales suggest a persistently anemophilous offshoot from the parent group of the obviously interrelated Ranunculales and Rosales, in both of which is found here and there the anomaly of spaced heavy medullary rays which Quercus and Fagus show, but which is absent from their close relatives Nothofagus, Castanea, and Castanopsis, and in the former of which orders trimerous flowers are not infrequent.

A rather recent analysis of the floral structure by Berridge has led to the conclusion that the Fagaceae ought to be ranged near the epigynous Rosaceae. Though very recently, largely on anatomical grounds, Hoar has come into agreement with earlier students who believe the Fagales to be primitive rather than reduced, it seems safe to expect that as the phylogeny of the main groups of flowering plants is gradually rectified, and especially when taxonomists come to uniformity in deriving Monocotyledons and Dicotyledons from a common ancestral line instead of leading the latter off from the former, the Fagales will find place near both of the indicated relatively primitive but polymorphic orders that now are usually widely separated from them and from one another; from one of which, with some plausibility, Salicales and Leitneriales have been suggested as simplified offshoots, as Myricales, Juglandales, and Fagales have from the other.

GENERA OF FAGACEAE.

Though generic characters in the Fagaceae are more or less interblended, the family is now divided by common consent into two sections, Fageae and Castaneae, within which the genera are separated as follows:

Cotyledons plicate, fruit 3-sided, catkins not elongated ..... FAGEAE.
  Staminate flowers 1–3 together, medullary rays uniformly thin ..... *Nothofagus.*
  Staminate flowers in dense slender-stalked clusters, some medullary rays very thick ..... *Fagus.*
Cotyledons not plicate nor fruit 3-sided, staminate flowers in catkinlike clusters ..... CASTANEAE.
  Catkins erect, with the flowers in groups.
    Stigmas short decurrent on the slender styles, fruiting involucre spiny, medullary rays uniformly thin.
      Catkins fertile at base, fruit annual ..... *Castanea.*
      Fertile flowers apart from the staminate, fruit biennial. (Wood section, pl. 5) ..... *Castanopsis.*
    Stigmas terminating the styles, fruiting involucre with scales or rings, some medullary rays very thick.
      (Wood section, pl. 5) ..... *Pasania.*
  Catkins drooping, with separate flowers, some medullary rays very thick. (Wood sections, pl. 6–9) ..... *Quercus.*

SUBGENERA OF QUERCUS.

Application of the characters that have been analyzed results in a conviction that the American oaks belong to three primary groups: (1) White oaks, LEUCOBALANUS, with deeply parted staminate perianth, a third set of stamens more or less completely developed, anthers mostly notched at tip, short styles, very short broad horizontally spreading stigmas, prompt fertilization, annual maturation of the fruit in which the abortive ovules are basal and the inside of the shell glabrate, and rather acuminate often corky-thickened cup scales; (2) black or red oaks, ERYTHROBALANUS, with cup-shaped staminate perianth, about six stamens, rather mucronate anthers, elongated curving styles gradually dilated into the spatulate stigmas, usually delayed fertilization and biennial maturation of the fruit in which, except for a few sets of species, the abortive ovules are apical and the inside of the shell very woolly, and more gradually pointed or blunt only exceptionally thickened cup scales; and (3) intermediate oaks, PROTOBALANUS, with the deeply lobed staminate perianth, numerous stamens, short broad styles, deeply lateral abortive ovules and pointed cup scales of the first group, but acuminate anthers, biennial fruit maturation and hairy inside of the shell of the second.

The white and intermediate oaks agree in general in having a light often flaking or checked bark, pale compact wood of characteristic slow growth with the ducts usually plugged by tyloses; and though sometimes entire or denticulate or serrate, their leaves are frequently lyrate or round lobed and they are never more than mucronate from the ends of the veins. The black oaks, on the other hand, have dark often deeply fissured but not flaking bark and often red,

usually softer and more openly porous wood of characteristic rapid growth; and their leaves, more frequently entire, are often serrate or incisely sharp lobed and frequently aristate from the ends of their veins.

The intermediate and black oaks are unknown except in America; the group of white oaks includes also the species native to northern Europe, but it is absent from Asia. As here understood, the American species number 371, of which 177 belong to Leucobalanus, 5 to Protobalanus, and 189 to Erythrobalanus. Of this total, 173 species are here described as new, or raised to specific rank or given new specific names though earlier described, and numerous varieties are here named and figured for the first time.

Though the present study is concerned with American species only, it may be added that the Asiatic oaks appear to fall naturally under two main types, both with slender styles stigmatic down the inner face, of which one has loose, distinct cup scales and the other, of the Tropics, has a cup on which the scales are more or less completely merged in encircling rings. The oaks of temperate Asia, the leaf serrations of which are sometimes long mucronate or even aristate though in other species the leaves are round lobed, fall into this general group. Those of the Orient are partly of this type, *e. g.*, *Q. Cerris*, *Q. Suber*, etc., but in large part of the white-oak group with broad stigmas. By common consent the Asiatic oaks of the type represented in the Californian region by what has been called *Q. densiflora*, which have erect catkins bearing their crowded flowers in clusters and minute stigmas terminal on the styles, are now segregated under the generic name Pasania.

GROUPS OF SPECIES.

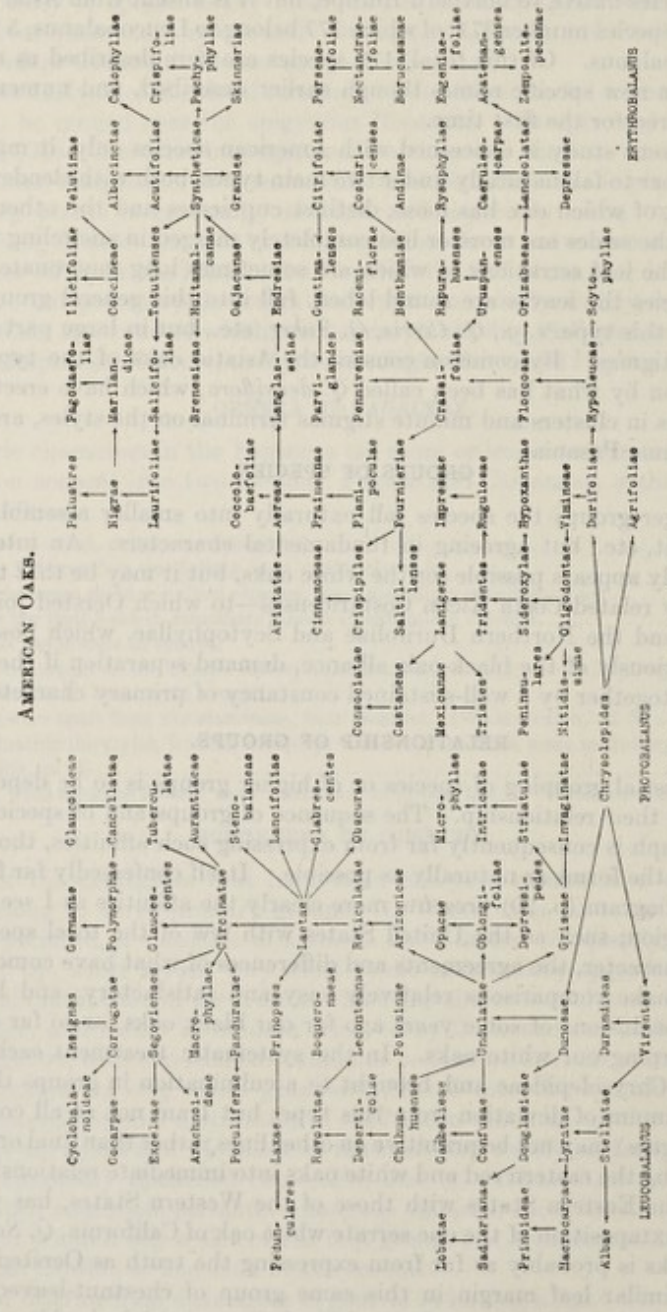
Within the larger groups the species fall naturally into smaller assemblages, differing in form of leaf and fruit, etc., but agreeing in fundamental characters. An intermediate assembling of these scarcely appears possible for the white oaks, but it may be that the Andean black oaks and the closely related Costa Rican Costaricenses—to which Oersted joins *Q. citrifolia*—and *Q. borucasana* and the Northern Durifoliae and Scytophyllae, which possess basal ovules though they are obviously of the black-oak alliance, demand separation if the remaining black oaks are to be held together by a well-sustained constancy of primary characters.

RELATIONSHIP OF GROUPS.

Obviously, no serial grouping of species or of higher groups is to be depended on to show even approximately their relationship. The sequence of groups and of species within them in the present monograph is consequently far from expressing such affinities, though an effort has been made to group the forms as naturally as possible. Itself confessedly far from satisfactory, the accompanying diagram (p. 20) presents more clearly the affinities as I see them.

For a given region, such as the United States with few of the total species and these of fairly well-known character, the agreements and differences of what have come to be recognized as stable features make comparisons relatively easy and satisfactory; and I have seen little reason to modify conclusions of some years ago for our black oaks, or so far as they go, those of Miss Cobb concerning our white oaks. In the systematic treatment each group is led off from the synthetic Chrysolepideae and brought to a culmination in groups that appear to me to present the maximum of deviation from this type; but I am not at all convinced that the latter (*e. g.*, the Insignes) may not be primitive on other lines rather than final on the one adopted.

No effort to bring the eastern red and white oaks into immediate relationship, or to connect the black oaks of the Eastern States with those of the Western States, has worked out satisfactorily; and the juxtaposition of the one serrate white oak of California, *Q. Sadleriana*, and the eastern chestnut oaks is probably as far from expressing the truth as Oersted's location of the Japanese oaks of similar leaf margin in this same group of chestnut-leaved oaks. Even so simple a question as that of the interrelationship of the round-lobed white-oak groups of the Atlantic, Rocky Mountain, and Californian regions is far from being answered easily, and one is tempted to concur in de Candolle's opinion (Prodromus, vol. 16, pt. 2, p. 23) that the Californian white oaks are more closely comparable—possibly in derivation as well as in aspect—with those of northern Europe than with those of eastern America.



RELATIONSHIP OF GROUPS.

Whatever of phylogeny is to be read into even such a grouping as is here given must be accepted therefore with the certainty that even if it be correct in principle many gaps exist where the family tree is now made to appear continuous. If at all, these gaps will have to be filled in all probability through the discovery of very late Tertiary fossils showing either a greater earlier distribution of existing groups of species than they now have, or through bridging by intermediates the breaks between groups that do not appear now to be capable of connection.

NOMENCLATURE.

The suggestion was made by Oersted, though not actually followed out by him, that black oaks are sufficiently distinct from white oaks to justify the retention of the generic name Quercus for one of the groups and the segregation of the other under a different name. If this were to be done, *Quercus Robur* standing as its type, the genus Quercus would include the white oaks, and one or more other generic names would be applied to the others. Though in some respects such a treatment would be convenient and justifiable it appears likely to do more harm than good, and the occasional blending of the usually marked fundamental characters of the groups is such as to make me feel that it should not be adopted. The genus Quercus as here treated is held therefore to consist of five sections or subgenera, for which names proposed by the distinguished Danish botanist are adopted except that Engelmann's name Leucobalanus is used in preference to Oersted's Lepidobalanus, which should properly apply to the scaly cupped oaks collectively in contrast with Cyclobalanopsis.

SYNONYMY.

No effort has been made to give here more than the citations necessary for a clear understanding of the name to be applied to each species on rules of priority, except that full reference has been made to illustrations. It should be understood that many published allusions to the Mexican species may prove misleading, but the full citation of collections in the present monograph makes it possible for one to ascertain just what was meant by a given writer who has referred definitely to his material, and a cumbersome and confused synonymy has not been attempted. In every instance its oldest published specific name has been adopted for a species unless this were preoccupied either for a living or fossil form, and available herbarium names have been used, with due credit, for unpublished species whenever possible.

DESCRIPTION.

Though somewhat full, and with inclusion of repetitions which might have been avoided by a synoptic treatment, the specific descriptions are as concise and closely comparable with one another as attention to mechanical detail has made possible, and lack of data has been indicated. Characters underlying the primary division of the genus have been examined in all cases when this has been possible and the grouping of even incomplete materials rests upon them; but it has not been thought necessary to repeat them in specific descriptions, and it is evident from these when characters have been assumed and not actually seen. The many species of which the fruit is unknown have been classified, obviously, through reliance on the assumed correlation of their known characters with those primarily derivable from the fruit in comparable forms. For the species of the United States, fully and repeatedly described in many and easily accessible publications, descriptions have been omitted except for the few words employed in keying them out under their respective groups.

ILLUSTRATIONS.

Throughout my study, detailed photographs of types were made everywhere, and for permission to make these I am deeply grateful to the owners or curators of collections in which the types occur. I am also under great obligation to several friends for photographs of material made in the larger European herbaria after my return to this country.

The photographs are here reproduced, with indication of the source in each case, as an indispensable part of the monograph, my feeling being that however detailed descriptions may

be made, nothing short of full illustration from authentic material can be counted on to make the species of this confused genus recognizable. Here, as in the text, it has been felt unnecessary to include the oaks of the United States except in a few cases where no illustration has been published yet or where synonymy has been badly confused or many forms have been segregated. Of the 371 species admitted for the entire American flora, over 50 per cent are now figured for the first time, as well as a large number of minor forms.

GEOGRAPHIC DISTRIBUTION.

Though a widely distributed genus, Quercus is not world-wide in its occurrence. It is absent from Africa, except for a few species of the Orient which cross the Mediterranean but remain confined to the north; and from the Australian region, though Tertiary fossils have been referred to it from Australia and New Zealand. It centers in India, from which it extends far into temperate Asia and through the Orient into Europe; and in the highlands of Mexico, from which it extends through the United States, and through Central America into the Colombian Andes, reaching also in one species each the West Indies to the east and Guadalupe Island to the west.

As they are here understood the living American oaks are distributed geographically as follows; each unit area in the broken countries to the south of us having about seven times as many species as in the less diversified Atlantic United States.

Country.	Leucobalanus.	Protobalanus.	Erythrobalanus.	Total.
Canada	6	0	4	10
United States	54	4	26	84
Mexico	123	2	128	253
Guatemala	10	0	16	26
British Honduras	1	0	0	1
Honduras	2	0	2	4
Nicaragua	2	0	0	2
Salvador	1	0	3	4
Costa Rica	4	0	13	17
Panama	1	0	2	3
Colombia	0	0	4	4
Cuba	1	0	0	1

RANGE.

Familiarity with such species as *Quercus alba*, *Q. maxima*, and *Q. stellata*, which are to be found over a large part of the eastern United States, leads one to recognize an ability in the oaks to occupy large areas, and the oaks of northern Europe give a parallel indication. This, however, is rather apparent than real, for winter cold confines a number of species to our Southern States, *Q. montana* is rather closely restricted to the Appalachian range, *Q. ellipsoidalis* occurs only west of Lake Michigan, and environment exercises a marked local influence on such species as *Q. nigra*, *Q. Phellos*, and *Q. bicolor*, on the one hand, and *Q. marilandica*, *Q. stellata*, and *Q. prinoides* on the other—the former affecting wet, and the latter dry situations.

In general the range of the species of Quercus conforms to the usual laws of geographic distribution of plants in which the summation of numerous meteorologic factors plays a larger part than any one, unless very extreme, condition. As illustrating this, not a single oak of the Mississippi Valley is found in the Rocky Mountains; not one of the Rocky Mountain species penetrates far into Mexico or reaches California; and typical black oaks are entirely absent from the Rocky Mountains while the few representatives of this group found in California are very different from those of the East. The chief reason for this lies in the division of the continent into large areas differing greatly in altitude, mean and extreme temperature, rainfall, and dryness of the air with attendant evaporation, these so-called meridional areas succeeding one another serially from east to west as north and south stripes.

REGIONS.

Without carrying it to an extreme refinement, continental America may be said to comprise the following regions which, for the oaks, are distributional areas: (1) The Atlantic region, lying east of the arid great plains and reaching from the far north to the Gulf; (2) the Rocky Mountain region, lying between the plains and the great basin; (3) the Chihuahuan region, of northern Mexico and the United States—in general the little elevated area into which the Rocky Mountains and the eastern and the Californian Sierras and the western Sierra Madre ranges fall away and out of which the table-land rises to the south; (4) the Californian region, of which Lower California receives a mountainous or desert extension; (5) the western and (6) the eastern Sierra Madre regions, flanking (7) the table-land and blending to the south into (8) the Cordilleran region; (9) The Central American region, more conveniently than logically differentiated biologically; (10) the Isthmian region, where the northern mountains fall away before rising into the heights of (11) the Andean region, into which Quercus penetrates only to the extent of a few interior valleys in Colombia. So far as the oaks are concerned, the Antillean region requires consideration only as harboring one variant of a type from the southern Atlantic United States; and the Pacific oceanic island Guadalupe possesses one species in common with the coastwise islands of southern California. (Frontispiece map.)

REGIONAL ABUNDANCE OF SPECIES.

Region.	Leucobalanus.	Protobalanus.	Erythrobalanus.	Total.
Atlantic	19	0	21	40
Rocky Mountain	19	0	0	19
Californian	7	3	4	14
Pacific Island	0	1	0	1
Desert	3	1	2	6
Chihuahuan	3	0	0	3
West Sierran	47	1	46	94
Table	21	0	28	49
Cordilleran	23	0	28	51
East Sierran	22	0	23	45
Central American	28	0	43	71
Andean	0	0	4	4
Antillean	1	0	0	1

A glance at the two distribution tables shows that by far the greatest variety in American oaks is found in the Mexican highlands and that the Western Sierra Madre Range is preeminent in this respect. It is instructive to note that white and black oaks, which occur in about equal numbers in the Eastern United States, preserve this parity in a general way in the Mexican sierras, cordillera, and table-land; that the West-American intermediate oaks, which alone have reached Guadalupe, are associated with more white than black oaks in the Californian and Chihuahuan regions; that the Chihuahuan flora in this respect is clearly a southern extension of that of the Rocky Mountains which, like the Antilles, possess only white oaks; and that in forms black oaks are twice as abundant as white oaks in Central America, and alone—in close relatives of Costa Rican species—reach South America.

Except for the comparatively uniform large Atlantic region, each of the areas considered is mountainous and diversified in precipitation and tenacity of water, and the fact that the genus is so broken into closely related species of limited range is evidently connected with this circumstance. Of the tropical species two only, *Quercus polymorpha* and *Q. oleoides*, both white oaks, are known from between extremely remote points; these species occur, at intervals if not continuously, from northern Mexico into Central America, the former following the Eastern Sierra Madre and Cordillera, and the latter, also of the Eastern Sierra Madre, reappearing in Costa Rica after a wide break.

With very few exceptions a given species is confined to one of the naturally limited distributional regions; the most marked deviations from this rule are afforded by a number of species

which pass from the eastern to the western sierras, but generally by way of the cordillera into which these ranges, and to a certain extent their species, blend.

As a general thing, groups of related species though less localized than the individual species are also limited in this respect. Exceptionally wide range is shown by the group Virentes, which, represented by a number of closely related species in the Southeastern States and reaching Cuba and even Costa Rica in one species each, reappears on the peninsula of Baja California; and by the synthetic Chysolepides, which though of few forms and typically Californian, have secured footing in the island of Guadalupe and, like the Virentes and Oblongifoliae, are represented by equivalent species on both sides of the Colorado desert.

GEOLOGIC HISTORY.

THE GENUS AT LARGE.

Like many other existing genera of trees and shrubs, Quercus made its appearance in the Cretaceous, and it is found in all subsequent geologic formations. Fossils referred to this genus are found even in the South Pacific, which lacks oaks to-day. As a rule, the materials on which determinations rest are extremely fragmentary—leaves or parts of leaves for the most part, or in some cases petrified bits of wood to which it is venturesome to hazard attaching more than the generic name.

Fortunately, with the exception of one, *Q. Marcyana*, the wood fragments have not received specific names. Notwithstanding the fact that some existing oaks present fairly diagnostic wood characters, it is questionable if any of these fossil woods can ever be identified satisfactorily with past or present species that are known from other characters unless their connection with foliage or fruit or their geographic occurrence furnish unusually strong corroborative evidence, as the latter does in the case of *Q. Marcyana* of Illinois.

As the materials have accumulated, opinions very naturally have changed in regard to some of them; and the botanists who first named them or other paleontologists have transferred many of them with reason to other genera or even families. A considerable number that were considered at one time to be oaks are now relegated to *Dryophyllum*, which is held to be prototypic of the Fagaceae rather than of the genus Quercus.

AMERICAN FOSSILS.

What is known of the early history of the genus on this continent has been learned from the study of fossils contained in scattered Cretaceous, Tertiary, and Quaternary deposits which occur here and there over a large part of North America from Alaska to the Atlantic and from Canada to the Gulf. I do not know of any from Mexico, where considerably more than half of the existing American species occur; from Central America, which possesses more than half as many species as the United States to-day; from the West Indies, where one species is now found; or from the Andes, in which four species occur now; but four Pliocene fossil oaks are reported from equatorial Brazil, far from any known living oaks. As in other genera, the fossils are often inadequate for satisfactory study, and only two of them—the Eocene *Q. consimilis* and *Q. paucidentata* if, indeed, these be more than a single species—occur with fruits.

Professor Berry, who has looked into the matter, tells me now that the reputed Brazilian fossils certainly do not represent Quercus.

At first, as with existing plants, the tendency was to identify American material with European species if the resemblance were at all close, and to see identities in comparable leaves of the same general horizon from different parts of North America. One by one the identifications of American with Old World species have been discarded, often by those who first published them, until at present the few European fossil oaks supposed to occur also in America seem to have escaped reexamination rather than to have had the claim made good that they occur on both continents. It may be questioned very pertinently, also, whether any fossil oak species of the Northwest occur far from that region; or any of the Rocky Mountain fossil species in the vicinity of the Gulf, even though found in formations held to be of like age.

NOMENCLATURE.—The extensive and troublesome nomenclature of existing species of Quercus has been complicated seriously by the one-time practice of naming fossil species without regard to the names applied to those now living. In the tabulation of American fossils which have been referred to Quercus I have tried to remove this confusion by renaming fossil species the names of which were preoccupied—just as, elsewhere in the work, I have renamed existing species found to bear names which had been applied earlier to fossils.

CLASSIFICATION.—For convenience in assembling the fossil materials they have been classified[6] roughly on the leaf-form and margin into the following series of formal groups. It should be understood distinctly that except for species of comparable locality or horizon these groups are purely artificial; but apart from convenience in naming and comparing specimens, they offer a general indication of the prevalence and persistence of various types of foliage.

GROUPS OF AMERICAN FOSSIL OAKS.

Leaves entire.
- Oblanceolate-obovate, large.....MAGNIFOLIAE.
- Lanceolate or oblong, moderate.....SIMULATAE.

Leaves toothed.
- Teeth numerous, small and sharp.
  - Leaves elongated, moderate.....FRAXINIFOLIAE.
  - Leaves short and broad, small.....SPURIO-ILICES.
- Teeth sparse or coarse.
  - Leaves broad, moderate.....DISTINCTAE.
  - Leaves elongated.
    - Rather large, not pointed.....CASTANEOPSES.
    - Moderate, acuminate.....PAUCIDENTATAE.
    - Small, not pointed.....SPURIO-ILICES.

Leaves crenate or repand.
- Rather elongated and small.....MYRICIFOLIAE.
- Broad, moderate.
  - Some teeth acute.....SUSPECTAE.
  - Teeth all rounded.....DALLIEAE.

Leaves incised or lobed.
- Lobes or shoulders 2 or 3, subapical.....BICORNES.
- Lobes or divisions several, not apical.
  - Leaves small, few-lobed.....LAMBERTENSES.
  - Leaves moderate or large.....LOBATAE.

As was pointed out when they were suggested, the following of these groups, which find no parallel in the genus as it exists now, may be questioned as really pertaining to Quercus: Fraxinifoliae (Cretaceous 11 per cent and Eocene 17 per cent), Distinctae (Cretaceous 15 per cent, Eocene 15 per cent, and Miocene 15 per cent), Suspectae (Cretaceous 20 per cent, Eocene 10 per cent, Miocene 4 per cent). Myricaefoliae (Cretaceous 2 species, Miocene 1 species), Bicornes (Eocene 2 species), Dallieae (Eocene 1 species).

SUCCESSION.—The general foliage range of Quercus—as understood—in Cretaceous, Eocene, and Miocene times is best indicated by a selection of types for each period. Except for the entire and holly types little comparability exists between Cretaceous and modern oak foliage. If *Q. neriifolia*, *Q. Dallii*, *Q. viburnifolia*, *Q. negundoides*, and *Q. pseudo-alnus* are excepted the plate representing Eocene foliage is easily paralleled among existing forms. In still stronger contrast with the earliest, the types figured from the Miocene might well be grouped among existing forms. (Pls. 11–13.)

PERSISTENCE.—Notwithstanding a considerable comparability in certain cases, identities have not been seen by paleobotanists when comparing oaks of different horizon, except that Lesquereux thought that he recognized a form of the existing Californian intermediate oak, *Q. chrysolepis*, in one of the Miocene forms. As I understand them, the four Brazilian Pliocene oaks described by Krašan are of aberrant types, and not comparable with any existing species. On the other hand a few species named by Berry from Gulf deposits believed to

[6] Trelease The ancient oaks of America. (Memoirs Brooklyn Botanic Garden. vol. 1, p. 492-501, pl. 13-22. 1918.)

represent the very late Pliocene are distinctly of existing types, if not even, as some of them are believed to be, of existing species; and this obviously is true of *Q. alba*, *Q. macrocarpa*, and *Q. palustris* of the cave deposit at Port Kennedy, Pa., for which Pliocene age is claimed by Hay and Baker, against their general reference to the Pleistocene. Except for *Q. Glennii*, which I can hardly believe to be a Pleistocene oak, all known Pleistocene species are essentially identical with oaks that are found living to-day in the regions where their remains occur.

ABUNDANCE.—In the United States, which now supports about 85 species of oaks, some 18 of which occurred in the Pleistocene and 4 in what is taken for the very late Pliocene, about twice as many species have been detected in earlier deposits, somewhat equally distributed through the longer periods of geologic time: Cretaceous, 48; Eocene, 56; Miocene, 42. There appears to be reason, therefore, for believing that for a very long time the genus has been as rich in North American species as it is now, if the various fossil forms still retained by paleontologists in Quercus are to be taken for oaks. Though the Cretaceous, Eocene, and existing assemblages are comparable in the range of their foliage forms, progression is seen in the types from age to age, and one may seek among the earlier species hopefully for prototypes of those that are now known.

AFFINITIES.—No student of the genus has brought to bear so great industry, practice, and experience as the late Baron von Ettingshausen. One paper in particular, which he published jointly with Krašan, contains a long tabulated comparison of apparent affinities between existing American oaks and fossil species, largely European. Instructive as these comparisons are, their very thoroughness causes them to carry internal evidence of the inefficiency of venation characters as a foundation for general conclusions on relationship, for while many of the alliances are incontrovertible, a single fossil sometimes brings into comparison living species that are known to be quite unrelated except as falling within the limits of the genus. A few such cases follow: *Quercus liriodendroides* brings into comparison the Californian white oak, *Q. Garryana*, and the eastern black oak, *Q. ilicifolia; Q. Zoroastri*, the white oak, *Q. oocarpa*, and the black oak, *Q. Skinneri; Q. lauriformis*, the white oak, *Q. grisea*, the intermediate oak, *Q. chrysolepis*, and the black oaks, *Q. lanceolata* and *Q. laurina; Q. chlorophylla*, the white oak, *Q. virginiana*, and the black oak, *Q.? imbricaria*, while this southern white "live oak," sterile specimens of which have misled more than one excellent botanist, is brought into comparison with another black oak, *Q. Phellos*, by *Q. elaena*. On the whole, I find little reason to see other than generic relationship between existing species and those of any earlier period, or between those of any two of these periods.

SPECIES REPORTED AS FOSSIL IN AMERICA.	Europe.	Locality.	Cretaceous.	Eocene.	Miocene.	Pliocene.	Pleistocene.	Existing.
QUERCUS ABNORMALIS Berry, Journ. Geol. **15**:342. 1907. (Believed to be teratological *Q. Phellos*).	.....	N. C.	.....	.....	.....	.....	×	Atl.
Q. ACRODON Lesq.=*Q. Lesquereuxiana.*								
Q. ACUMINATA Sarg.=*Q. Muehlenbergii.*								
Q. AEMULANS Lesq., Rep. Geol. Surv. Terr. **1871**:288.	.....	Wy.	.....	×	.....	.....	.....	.....
Q. AFFINIS Knowlt.=*Q. clarnensis.*								
Q. AGRIFOLIA Née.	.....	Cal.	.....	.....	.....	.....	×	Cal.
Q. ALASKANA Trel., Mem. Brooklyn Bot. Gard. **1**:499. 1918. (*Q. pandurata* Heer—not H.&B.).	.....	Al.	.....	×	.....	.....	.....	.....
Q. ALBA L. (See also entry under *Q. pseudoalba*).	.....	E. Am.	.....	.....	.....	.....	×	Atl.
Q. ALNOIDES Lesq., Monogr. Geol. Surv. **17**:54. 1891.	.....	Kas.	×	.....	.....	.....	.....	.....
Q. ANCEPS Lesq.=*Diospyros nebraskana.*								
Q. ANGUSTILOBA Lesq.=*Q. praeangustiloba.*								
Q. ANTIQUA Newb., Ann. N. Y. Lyc. **9**:26. 1868.	.....	Vt.	×	.....	.....	.....	.....	.....
Q. APPELGATEI Knowlt., Rep. Geol. Surv. **20**[3]:42. 1900.	.....	Or.	.....	.....	×	.....	.....	.....
Q. APPROXIMATA Jennings, Mem. Carnegie Mus. **8**:419. 1920.	.....	Mon.	.....	×	.....	.....	.....	.....

SPECIES REPORTED AS FOSSIL IN AMERICA.	Europe.	Locality.	Cretaceous.	Eocene.	Miocene.	Pliocene.	Pleistocene.	Existing.
Q. AQUAMARA Knowlt., Bull. Geol. Surv. 152:189. 1898		Wy.	×					
Q. ARGENTUM Knowlt., Rep. Geol. Surv. **21** [2]:215. 1901		Nev.			×			
Q. **asymmetrica** n. nom (*Q. dubia* Newberry—not L.).		Wy.		×				
Q. ATTENUATA Lesq.=*Q. viburnifolia.*								
Q. BALANINORUM Cocker., Bull. Am. Mus. N. H. **24**:86. 1908		Col.			×			
Q. BANKSIAEFOLIA Newb., Bost. Journ. N. H. **7**:522. 1863		Was.		×				
Q. BAUERI Knowlton, Prof. Pap. Geol. Surv. 98S:337. 1916		N. M.	×					
Q. BENZOIN Lesq.=*Persea Leconteana.*								
Q. BERRYI Trel., Mem. Brooklyn Bot. Gard. **1**:499. 1918 (*Q. Breweri* Lesq.—not Watson.)		Or.		×				
Q. BICOLOR Willd		N. C.					×	Atl.
Q. BICORNIS Ward, Rep. Geol. Surv. **6**:551. 1886		Mon.		×				
Q. BOWENIANA Lesq., Mem. Mus. Comp. Zool. **6** [2]:6. 1878		Cal.			×			
Q. BRAZILIENSIS Krasser, Sitzb. Akad. Wien. **112** [1]:854. 1903 (Not believed to be an oak.)		S. A.				×		
Q. BREVIFOLIA Sarg.=*Q. cinerea.*								
Q. BREWERI Lesq.=*Q. Berryi.*								
Q. CALIFORNICA Lesq.=*Mespilodaphne pseudoglauca.*								
Q. CALVERTONENSIS Berry, Journ. Geol. **17**. Errata p. 24		Va.				×		
Q. CARBONENSIS Ward, Rep. Geol. Surv. **6**:551. 1886		Wy.		×				
Q. CASTANEOPSIS Lesq., Rep. Geol. Surv. Terr. **8**:155. 1883		Wy.		×				
Q. CASTANOIDES Newb., Proc. Nat. Mus. **5**:506. 1883 (-preceeding)		Wy.		×				
Q. CASTANOPSIS Newb., Proc. Nat. Mus. **5**:505. 1883		Mon.		×				
Q. CATESBAEIFOLIA Berry, Prof. Pap. Geol. Surv. 98L:200. 1916		Ala.				×		
Q. CELASTRIFOLIA Lesq., Bull. Mus. Comp. Zool. **16**:46. 1888		Col.		×				
Q. CHAMISSONIS Heer, Ofvers. K. V. Akad. Forh. **1868**:64	×	Al.		×				
Q. CHAPMANI. Sarg		Fla.					×	Atl.
Q. CHAPMANIFOLIA Berry, Prof. Pap. Geol. Surv. 98F:66. 1916		D. C.			×			
Q. CHLOROPHYLLA Lesq.=*Q. eucalyptifolia.*								
Q. CHLOROPHYLLOIDES Knowlt.=*Q. eucalyptifolia.*		Cal.					×	Cal.
Q. CHRYSOLEPIS Liebm		Cal.			×			
Q. CHRYSOLEPIS MONTANA Lesq., Proc. Nat. Mus. **10**:38. 1887 (Questionable as pertaining to *Q. chrysolepis.*)		Fl.					×	Atl.
Q. CINEREA								
Q. CINEREOIDES Lesq., Rep. Geol. Surv. Terr. **7**:152. 1878. (Locality and age unrecorded.)								
Q. CLARNENSIS Trel., Mem. Brooklyn Bot. Gard. **1**:499. 1918 (*Q. affinis* Knowlton—not Scheidw.).		Or.		×				
Q. CLEBURNI Lesq.=*Dryandroides cleburni.*								
Q. COCKERELLII Trel.=*Q. Hatcheri.*								
Q. COLORADENSIS Lesq., Bull. Mus. Comp. Zool. **16**:46. 1888		Col.		×				
Q. COMPETENS Lesq., Bull. Geol. Surv. **1**:370. 1876		Wy.	×					
Q. CONSIMILIS Newb., Proc. Nat. Mus. **5**:505. 1883		Or.		×				
Q. CONVEXA Lesq., Mem. Mus. Comp. Zool. **6** [2]:4. 1878		Cal.			×			
Q. CORIACEA Newb., Boston Journ. N. H. **7**:521. 1863		Wa.		×				

SPECIES REPORTED AS FOSSIL IN AMERICA.	Europe.	Locality.	Cretaceous.	Eocene.	Miocene.	Pliocene.	Pleistocene.	Existing.
Q. CRASSINERVIS Lesq.=*Dryophyllum tennesseensis.*								
Q. CROSSII Lesq., Proc. Nat. Mus. **10**:39. 1887		Col.		×				
Q. CULVERI Knowlt., Mon. Geol. Surv. **32**:708. 1899		Mon.	×					
Q. CUNEATA Wang.=*Q. rubra.*								
Q. CUNEATA Newb.=*Q. Newberryi.*								
Q. CUSPIDATA Lesq.=*Dryophyllum tennesseensis.*								
Q. DAKOTENSIS Lesq., Rep. Geol. Surv. Terr. **8**:39. 1883		Kas.	×					
Q. DALLII Lesq., Proc. Nat. Mus. **5**:446. 1883		Al.		×				
Q. DAWSONI Knowlt., Bull. Geol. Surv. 152:191. 1898		Can.		×				
Q. DAYANA Knowlt., Bull. Geol. Surv. 204:51. 1902		Or.			×			
Q. DENTONI Lesq., Rep. Geol. Surv. Terr. **8**:224. 1883		N. D.		×				
Q. DENTONOIDES Knowlt., Bull. Geol. Surv. 163:40. 1900		Wy.	×					
Q. DIGITATA=*Q. rubra.*								
Q. DISTINCTA Lesq., Mem. Mus. Comp. Zool. **6** ²:6. 1878		Cal.			×			
Q. DOLJENSIS Pilar, Fl. Foss. Sused. 37. 1883.	×	Wy.		×				
Q. DRYMEJA Unger, Chloris Protogaea. 113. 1847	×	Or.		×				
Q. DRYOPHYLLOPSIS Trel., Mem. Brooklyn Bot. Gard. **1**:499. 1918 (*Q. latifolia* Lesq.—not Steudel.)		Kas.	×					
Q. DUBIA Newb.=*Q. asymmetrica.*								
Q. DURIUSCULA Knowlt., Bull. Geol. Surv. 204:50. 1902		Or.			×			
Q. EAMESI Trel., Mem. Brooklyn Bot. Gard. **1**:499. 1918 (*Q. salicifolia* Newb.—not Née.)		Neb.	×					
Q. ELAENA Unger, Chloris Protogaea. 112. 1847	×	Col.			×			
Q. ELAENOIDES Lesq., Mem. Mus. Comp. Zool. 6 ²:4. 1878		Cal.			×			
Q. ELKOANA Lesq.=*Carpinus elkoana.*								
Q. ELLIPTICA Newb.=*Q. washingtonensis.*								
Q. ELLISIANA Lesq., Rep. Geol. Surv. Terr. **1871**:297		Mon.	×					
Q. ELLSWORTHIANA Lesq., Amer. J. Sci. 2 ser. **46**:96. 1868		Kas. Neb.	× ×					
Q. EOPRINOIDES Berry, Bull. Torr. Bot. Cl. **31**:74. 1904		N. J.	×					
Q. EUCALYPTIFOLIA v. Ettingsh., Denkschr. Akad. Wien. **47**:116. 1883	×	Col. N. M. Mis.		×				
Q. EVANSII Lesq., Amer. J. Sci. 2 ser. **27**:360. 1859		Wa.		×				
Q. EXIMIA Knowlt., Bull. Geol. Surv. 606:527. 1919. (Name only.) =*Q. laramiensis* Trel.								
Q. FISHERIANA Knowlt., Prof. Pap. Geol. Surv. 101:297. 1917		Col.		×				
Q. FLEXUOSA Newb., Boston Journ. N. H. **7**:521. 1863		Wa. Mon.		×				
Q. FLORISSANTENSIS Cocker., Bull. Amer. Mus. N. H. **24**:85. 1908		Col.			×			
Q. FRAXINIFOLIA Lesq., Rep. Geol. Surv. Terr. **7**:154. 1878		Mon.		×				
Q. FURCINERVIS AMERICANA. Knowlton, Bull. Geol. Surv. 152:192. 1898		Or.		×				
Knowlton, Mon. Geol. Surv. **32**:705. 1899		Mon.			×			
Q. FURUHJELMI Heer, Ofvers. K. Vet. Akad. Forh. **1868**: 64		Al.		×				
Q. GARDNERI Knowlt., Prof. Pap. Geol. Surv. 101:259. 1917		Col.	×					

SPECIES REPORTED AS FOSSIL IN AMERICA.	Europe.	Locality.	Cretaceous.	Eocene.	Miocene.	Pliocene.	Pleistocene.	Existing.
Q. GAUDINI Lesq., Amer. J. Sci. 2 ser. **27**:360. 1859. (Locality and age unrecorded for America.)	×							
Q. GLASCOENA Lesq., Mon. Geol. Surv. **17**:55. 1891		Kas.	×					
Q. GLENNII Hollick, Md. Geol. Surv., Pli. & Pleist. 226. 1906. (Age questionable; not comparable with existing oaks.)		Md.					×	
Q. GODETI Heer, Fl. Tert. Helvet. **2**:50. 1856	×	Mon.		×				
Q. GOEPPERTI Lesq., Mem. Mus. Comp. Zool. **6**^{2}:7. 1878		Cal.			×			
Q. GOLDIANA Lesq., Rep. Geol. Surv. Terr. **1873**:398		Col.		×				
Q. GRACILIS Newb.=*Dryophyllum subfalcatum.*								
Q. GROENLANDICA Heer, Fl. Foss. Arct. **1**:108. 1868	×	Al.		×				
Q. GROSSIDENTATA Knowlt., Mon. Geol. Surv. **32**:704. 1899		Mon.			×			
Q. HAIDINGERI v. Ettingsh., Fl. Foss. Wien. 12. 1851	×	Col.		×				
Q. HATCHERI Knowlton, Proc. Biol. Soc. Washington, **19**:95. 1906		Mon.	×					
Q. HAYDENI Lesq., Amer. J. Sci. 2 ser. **45**:205. 1868		Wy.	×					
Q. HESPERIA Knowlt., Mon. Geol. Surv. **32**^{2}:709. 1899		Mon.		×				
Q. HEXAGONA Lesq., Amer. J. Sci. 2 ser. **46**:95. 1868		Kas. Neb.	×					
Q. HIERACIFOLIA Hosius & v. d. Marck, Fl. Westf. Cr. 166. 1880	×	Kas.	×					
Q. HOLLICKII Berry, Bull. N. Y. Bot. Gard. **3**:71. 1903		N. J.	×					
Q. HOLMESII Lesq., Mon. Geol. Surv. **17**:58. 1892		R. Mt. N. J.	×					
Q. HORNIANA Lesq., Proc. Nat. Mus. **11**:17. 1885		Or.			×			
Q. HOSIANA Lesq., Mon. Geol. Surv. **17**:57. 1892		Kas.	×					
Q. HUSSAKII Krasser, Sitzber. Akad. Wien. **112**^{1}:854. 1903. (Not believed to be an oak.)		S. A.				×		
Q. IDAHOENSIS Knowlt., Rep. Geol. Surv. **18**^{3}:729. 1898		Id.		×				
Q. IMBRICARIA FOSSILIS Lesq., Proc. Nat. Mus. **10**:39. 1887		N. J.					×	Atl.
Q. JOHNSTRUPI Heer, Fl. Foss. Arct. **7**:24. 1883	×	Al.	×					
Q. JUDITHAE Knowlt., Bull. Geol. Surv. 257:190. 1905		Mon.	×					
Q. KANSEANA Knowlt., Bull. Geol. Surv. 152:194. 1898		Kas.	×					
Q. KNOWLTONIANA Cocker., Amer. J. Sci. 4 ser. **26**:540. 1903		Col.			×			
Q. LAHARPI Lesq.=*Q. fraxinifolia.*								
Q. LAMBERTENSIS Berry, Prof. Pap. Geol. Surv. 98L. 200. 1916		Md.				×		
Q. **Laramiensis** (*Q. eximia* Knowlton, not *Q. eximea* Sargent.) n. nom.		Col.	×					
Q. LATIFOLIA Lesq.=*Q. dryophyllopsis.*								
Q. LAURIFOLIA Michx		Fl.					×	Atl.
Q. LAURIFOLIA Newb.=*Q. Penhallowi.*								
Q. LAUROSIMULANS Jennings=*Q. Penhallowi.*								
Q. LEHMANNII Hollick, Md. Geol. Surv. Miocene, 483. 1904		Md.			×			
Q. LESQUEREUXIANA Knowlt., Bull. Geol. Surv. 152:194. 1898		Wy.	×					
Q. LONCHITIS Unger, Gen. Sp. Pl. Foss. 403. 1850	×	Wy.		×				
Q. LYELLII Lesq.=*Nectandra lancifolia* in part.								
Q. LYRATA Walt		N. C.					×	Atl.
Q. LYRATIFORMIS Cocker., Bull. Amer. Mus. N. H. **24**:85. 1908		Col.			×			

SPECIES REPORTED AS FOSSIL IN AMERICA.	Europe.	Locality.	Creta-ceous.	Eocene.	Miocene.	Pliocene.	Pleis-tocene.	Existing.
Q. MACROCARPA Michaux		Can. Pa.					×	Atl.
Q. MAGNIFOLIA Knowlt., Mon. Geol. Surv. **32**[2]:704. 1899		Mon.		×				
Q. MARCYANA Penhallow, Proc. & Tr. Roy. Soc. Canada. 1891. sec. 4:31 (Wood, only, probably of *Q. Muehlenbergii:* compared by the author with *Q. Garryana* and *Q. Prinus* [*montana*].)		Ill.					×	Atl.
Q. MARILANDICA Muench		N. C.					×	Atl.
Q. MAXIMA Ashe (as *Q. rubra*)		Can.					×	Atl.
Q. MEDITERRANEA Lesq.=*Q. peritula.*								
Q. MERRIAMI Knowlt., Bull. Geol. Surv. 204:49. 1902		Or.			×			
Q. MICHAUXII Nutt.=*Q. Prinus.*								
Q. MICRODENTATA Hollick=*Dillenites microdentatus.*								
Q. MILLERI Berry=*Q. calvertonensis.*								
Q. MINOR Sargent=*Q. stellata.*								
Q. MONTANA Knowlton=*Q. Hatcheri.*								
Q. MONTANENSIS Knowlt., Bull. Geol. Surv. 163:11. 1900		Mon.	×					
Q. MOORII Lesq.=*Dryophyllum Moorii.*								
Q. MORRISONIANA Lesq., Rep. Geol. Surv. Terr. **8**:40. 1883		Col. N. J. Md.	×					
Q. MUDGII Lesq.=*Protophyllum Mudgii.*								
Q. MUEHLENBERGII Engelm (See also note under *Q. Marcyana.*)		Can.					×	Atl.
Q. MULTINERVIS Lesq., Amer. J. Sci. 2 ser. **27**:360. 1859		B. C.	×					
Q. MYRTIFOLIA Lesq.=*Sophora Lesquereuxii.*								
Q. NEGUNDOIDES Lesq., Rep. Geol. Surv. Terr. **1871**:292		Wy.		×				
Q. NEOMEXICANA Knowlt., Prof. Pap. Geol. Surv. 101:298. 1917		N. M.		×				
Q. NERIIFOLIA Lesq.=*Apocynophyllum* sp. pl.								
Q. NEVADENSIS Lesq., Mem. Mus. Comp. Zool. **6**[2]:5. 1878		Cal.			×			
Q. NEWBERRYI Trel., Mem. Brooklyn Bot. Gard. **1**:499. 1918 (*Q. cuneata* Newberry—not Wangenheim.)		Neb.	×					
Q. NIGRA L		Ala. N. C.				×	×	Atl.
Q. NOVAE-CAESAREAE Hollick, Trans. N. Y. Acad. **18**:131. 1897		N. Y. N. J	×					
Q. OBTUSILOBA Michaux=*Q. stellata.*								
Q. OCCIDENTALIS Knowlton=*Q. vancouveriana.*								
Q. OLAFSENI Heer, Fl. Foss. Arct. **1**:109. 1868	×	N. D.		×				
Q. OREGONIANA Knowlt., Bull. Geol. Surv. 204:47. 1920		Or.		×				
Q. OSBORNII Lesq., Rep. Geol. Surv. Terr. **8**:154. 1883		Col			×			
Q. PACIFICA Knowlt., Rep. Geol. Surv. **20**[3]:43. 1900		Or.			×			
Q. PALUSTRIS Muench		N. C. Pa. Md.					×	Atl.
Q. PANDURATA Heer=*Q. alaskana.*								
Q. PAUCIDENTATA Newb., Proc. Nat. Mus. **5**:505. 1883		Or.		×				
Q. PAYETTENSIS Knowlt., Rep. Geol. Surv. **18**[3]:730. 1898		Id.			×			
Q. PEALEI Lesq.=*Q. Ellisiana.*								
Q. PENHALLOWI Trel., Mem. Brooklyn Bot. Gard. **1**:499. 1918 (*Q. laurifolia* Newberry—not Michaux; *Q. laurosimulans* Jenn.)		Mon. N. D. B. C.		×	*X*			
Q. PERITULA Cocker., Bull. Amer. Mus. N. H. **24**:85. 1908		Col.			×			

SPECIES REPORTED AS FOSSIL IN AMERICA.	Europe.	Locality.	Cretaceous.	Eocene.	Miocene.	Pliocene.	Pleistocene.	Existing.
Q. PHELLOS L.		Ala. N. C. Mis. N. J.					×	Atl.
(Probably includes *Q. abnormalis.*)								
Q. PLATANIA Dawson=*Q. Dawsoni.*								
Q. PLATANIA Lesq.=*Platanus cordata.*								
Q. PLATANIA ROTUNDIFOLIA Lesq.=*Dombeyopsis platanoides.*								
Q. PLATANOIDES Sudworth=*Q. bicolor.*								
Q. PLATINERVIS Lesq., Amer. J. Sci. 2 ser. **27**:361. 1859		B. C.	×					
Q. PORANOIDES Lesq., Rep. Geol. Surv. Terr. **6**:66. 1874		Kas.	×					
Q. PRAEANGUSTILOBA Knowlton, Bull. Geol. Surv. 696:535. 1920		Col.	×					
(*Q. angustiloba* Lesq.).								
Q. PRAE-DUMOSA Trel., Mem. Brooklyn Bot. Gard. **1**:499. 1918		Nev.			×			
(*Q. Turneri* Knowlton—not Willdenow).								
Q. PRAE-MESPILIFOLIA Krasser, Sitzber. Akad. Wien. **112**[1]:854. 1903		S. A.				×		
(Not believed to be an oak.)								
Q. PRAE-UNDULATA Trel., Mem. Brooklyn Bot. Gard. **1**:499. 1918		Vt.	×					
(*Q. sinuata* Newberry—not Walter).								
Q. PRATTII Berry, Bull. Torr. Bot. Cl. **34**:192. 1907		N. C.	×					
Q. PREDIGITATA Berry, Journ. Geol. 15:342. 1907		N. C. Va.					×	Atl.
(Probably a form of *Q. rubra*).								
Q. PREVIRGINIANA Berry, Prof. Pap. Geol. Surv. 98L. 199. 1916		Ala.				×		
Q. PRIMORDIALIS Lesq., Amer. J. Sci. 2 ser. **46**:95. 1868		Kas.	×					
Q. PRINOIDES Willdenow		N. C.					×	Atl.
Q. PRINUS L.		N. C. Ala. Md.					×	Atl.
Q. PSEUDO-ALBA Hollick, Md. Geol. Surv., Pli & Pleist. 227. 1906		Md.					×	Atl.
(Probably a form of *Q. alba.*)								
Q. PSEUDO-ALNUS v. Ettingsh., Abhandl. Geol. Reichsanst. **13**:5. 1852	×	Or.		×				
Q. PSEUDO-CASTANEA Goepp., Palaeontographica. **2**. pl. 35. 1853	×	Al.		×				
Q. PSEUDO-CHRYSOPHYLLA Lesq., Mem. Mus. Comp. Zool. **6**[2]:60. 1878		Cal.			×			
Q. PSEUDO-DAPHNES Krasser, Sitzber. Akad. Wien. **112**[1]:854. 1903		S. A.				×		
(Not believed to be an oak.)								
Q. PSEUDO-LYRATA Lesq., Mem. Mus. Comp. Zool. **6**[2]:8. 1878		Or. Wash.			×			
Q. PSEUDO-LYRATA ACUTILOBA Lesq., Proc. Nat. Mus. **11**:17. 1888		Or.			×			
Q. PSEUDO-LYRATA ANGUSTILOBA Lesq.=*Q. Merriami.*								
Q. PSEUDO-LYRATA BREVIFOLIA Lesq., *l. c.* 18. 1888		Or.			×			
Q. PSEUDO-LYRATA LATIFOLIA Lesq., *l. c.* 18. 1888		Or.			×			
Q. PSEUDO-LYRATA OBTUSILOBA Lesq., *l. c.* 18. 1888		Or.			×			
Q. PSEUDO-WESTFALICA Berry, Prof. Pap. Geol. Surv. 84:35. 1914		S. C.	×					
Q. PYRIFOLIA Lesq.=*Q. florissantensis.*								
Q. RAMALEYI Cocker., Bull. Torr. Bot. Cl. **33**:309. 1906		Col.			×			
Q. RARITANENSIS Berry, Bull. Torr. Bot. Cl. **36**:249. 1909		N. J.	×					
Q. RATONENSIS Knowlt., Prof. Pap. Geol. Surv. 101:298. 1917		N. M.		×				
Q. RETRACTA Lesq.=*Myrcia bentonensis.*								
Q. RHAMNOIDES Lesq., Mon. Geol. Surv. **17**:57. 1892		Kas.	×					

SPECIES REPORTED AS FOSSIL IN AMERICA.	Europe.	Locality.	Cretaceous.	Eocene.	Miocene.	Pliocene.	Pleistocene.	Existing.
Q. ROCKVALENSIS Knowlt., Prof. Pap. Geol. Surv. 101:259. 1917		Col.	×					
Q. RUBRA L. (*Q. cuneata; Q. digitata; Q. falcata*)		W Va.					×	Atl.
(See entry of *Q. maxima;* and *Q. prodigitata.*)								
Q. SAFFORDI Lesq.=*Banksia Saffordi.*								
Q. SALICIFOLIA Newberry=*Q. Eamesi.*								
Q. SCUDDERI Knowlt., Proc. Nat. Mus. **51**: 265. 1916		Col.			×			
Q. SEMIALATA Lesq.=*Anisophyllum semialatum.*								
Q. SEMI-ELLIPTICA Lesq.=*Fagopsis longifolia.*								
Q. SERRA Unger, Chlor. Protogaea. 109. 1847	×	Col.			×			
	×	Col.			×			
Q. SEVERNENSIS Berry, Bull. Torr. Bot. Cl. **37**:22. 1910		Md.	×					
Q. SIMPLEX Newb., Proc. Nat. Mus. **5**:505. 1883		Or.		×				
Q. SIMULATA Knowlt., Rep. Geol. Surv. **18**^{3}: 728. 1898		Id.			×			
Q. SINUATA Newberry=*Q. prae-undulata.*								
Q. SPURIO-ILEX Knowlt., Mon. Geol. Surv. **17**:53. 1892		Kas.	×					
Q. STANTONI Knowlt., Prof. Pap. Geol. Surv. 108F. 86. 1917		Wy.	×					
Q. STEENSTRUPIANA Heer, Fl. Foss. Arct. **1**:109. 1868	×	Cal.			×			
Q. STRAMINEA Lesq., Rep. Geol. Surv. Terr. **1872**:378	×	Col.	×					
Q. SUBSINUATA Knowlt., Rep. Geol. Surv. 20^{3}:41. 1900		Or.			×			
Q. SULLYI Newb., Proc. Nat. Mus. **5**:506. 1883		N. D.		×				
Q. SUMTERENSIS Berry, Prof. Pap. Geol. Surv. 84:35. 1914		S. C.	×					
Q. SUSPECTA Lesq., Mont. Geol. Surv. **17**:52. 1892		Kas.	×					
Q. TINCTORIA Bartr.=*Q. velutina.*								
Q. TRANSGRESSA Lesq., Mem. Mus. Comp. Zool. **6**^{2}:59. 1878		Cal.			×			
Q. TRIANGULARIS Lesq.=*Q. viburnifolia.*								
Q. TURNERI Knowlton.=*Q. prae-dumosa.*								
Q. URSINA Knowlt., Bull. Geol. Surv. 204:51. 1902		Or.			×			
Q. VALDENSIS Heer, Fl. Tert. Helv. **2**:49. 1856	×	Mon.		×				
Q. VANCOUVERIANA Trel., Mem. Brooklyn Bot. Gard. **1**:499. 1918		B. C.	×					
(*Q. occidentalis* Knowlton—not Gay.)		Can.					×	Atl.
Q. VELUTINA Lam								
Q. VIBURNIFOLIA Lesq., Rep. Geol. Surv. Terr. **7**:159. 1878		Col. Wy. Mont.		×				
Q. VICTORIAE Dawson, Trans. Roy. Soc. Canada. **1**^{4}:27. 1882		B. C.	×					
Q. VIRENS Mich.=*Q. virginiana.*								
Q. VIRGINIANA Miller		Ala. Ky. Fl.					×	Atl.
Q. VOYANA Lesq.=*Q. distincta.*								
Q. WARDIANA Lesq., Mon. Geol. Surv. **17**:53. 1892		Kas.	×					
Q. WASHINGTONENSIS Trel., Mem. Brooklyn Bot. Gard. **1**:499. 1918		Was.		×				
(*Q. elliptica* Newberry—not Née.)								
Q. WEEDII Knowlt., Mon. Geol. Surv. **32**^{2}:705 1899		Mon.			×			
Q. WHITEI Lesq., Bull. Mus. Comp. Zool. **16**:46. 1888		Col.		×				
Q. WYOMINGIANA Lesq., Rep. Geol. Surv. Terr. **1872**:400		Wy.		×				
Q. YANCEYI Knowlt., Mon Geol. Surv. **32**^{2}: 707. 1899		Mon.		×				

EVOLUTION.

As I see them, there is nothing in the fossil oaks of America to warrant the conclusion that those of one large geologic period have passed into a succeeding period in a variety of forms corresponding to its own variety or that an extensive, even circumpolar, distribution can be shown for extinct species any more than for those now living. It is certain that existing species have no discovered Pleistocene or Pliocene records outside their present range; and every reason exists for disbelief in their close relationship with earlier forms.

The great variety of oak forms from the Cretaceous on, shown by even the fragmentary record afforded by their known fossils, the synthetic résumé of leaf form and venation given on heterophyllous individuals as in *Q. alba*, in single species like *Q. Douglasii* and *dumosa*, in groups of evidently closely related and only barely separable species like the Undulatae, in affiliated groups like the Laurifoliae, Palustres, and Nigrae, and in the European fossil glomeration known as *Q. Palaeo-Ilex*, all point to a long-existing foliage plasticity in the genus; and this is exemplified, though to a lesser extent, in the mutants of *Q. sessiliflora* and *Q. pedunculata*, with which European plantations are well stocked.

On the one hand (1) there is a temptation to believe that existing entire, chestnut, holly, and lobed leaved oaks have descended from early Tertiary or even Cretaceous prototypes possessing these several leaf forms; on the other (2), it seems reasonable to derive the existing forms of various regions through later local initials comparable with the mid-European *Q. Palaeo-Ilex*.

Against the first opinion is the fact that, except for *Q. Cerris* and the American black oaks, all of the present oaks of Europe, America, and at least temperate Asia look as if they might be closely related, as well as the occurrence of isolated monotypic representatives of two Asiatic genera of Fagaceae, Pasania, and Castanopsis, in the existing flora of the Californian region. Against the second idea are the distinctness with which the Cerris and Erythrobalanus subgeneric characters stand out; the correlated ovule displacement and unusual leaf form and venation of the outlying Andinae and their obvious relatives the Costaricenses, and of the other abnormal black oaks of the Durifoliae-Scytophyllae alliance; and the blending of even more marked white and black oak characters in the intermediate group Protobalanus. It may not be without significance, even, that von Ettingshausen recognized a leaf comparability between *Q. Humboldtii*, which I should take to be very close to the other Andinae, and the extinct Australian tree known as *Q. Wilkinsoni*.

I have pointed out elsewhere that the black oaks of the Californian region are very distantly related to those of eastern North America, and do not appear to be very closely related to those of the American Tropics. The Californian and Rocky Mountain white oaks are distinctly unlike those of the Atlantic region; and between the groups composing the latter some characters, like persistence of stipules, and very dissimilar forms of winter buds, are hard to set aside. In some respects, too, the tropical serrated-leaved sometimes very large-fruited oaks resemble in foliage North American types now extinct rather more than they do any living forms with which they may be compared.

On the whole, I am disposed to think that the existing oaks of temperate regions have developed since breaking of the circumpolar land connections of Tertiary time; that the genus may have penetrated Europe by way of the Orient in the Cerris and Ilex types; and that it may have reached America originally over one or more of the now vanished Pacific land connections that students of geographic distribution believe with more or less reason and unanimity to have existed still earlier.

The prevalence of apical abortive ovules and lateral stigmas in the family suggests that the Ilex and Leucobalanus groups are more modern than Erythrobalanus, and that the genus Pasania, with terminal stigmas, is a still more recent offshoot of the ancestral stock. This may not be inconsistent with the centering of the prevailing European oaks about *Quercus Ilex*, or its paralleling in the Tertiary *Q. Palaeo-Ilex*; and the comparability of European and West American white-oak foliage is conceivably explicable under this hypothesis.

The greatest difficulty in accepting this view lies in the assumption that black oaks are of a more ancient type than any of these diverse white-oak forms; and that, though possibly originally present in Australia, and, if their age be conceded, existing while Europe and North America were still continuous and with a warm climate in the far north, they do not now occur elsewhere than in America though on this continent they comprise rather more than half of the existing species.

While the foliage of entire-leaved black and white oaks differs markedly in some cases, there are others in which it is much alike in the two groups, so that it would be hard to conclude that the fossil entire leaves referred to Quercus represent species of the subgenera Leucobalanus or Ilex, especially since their shape is more closely paralleled by that of existing black than white oaks. Aside from these, it may be stated that the fossil oak leaves of both continents do not correspond to those of Erythrobalanus except for the European *Q. oligodonta* and the American *Q. ursina*, neither of which appears to have been bristle-lobed; and the ancient *angustiloba* type of both continents, though acute-lobed, is clearly more comparable with the lyrate white oaks than with the falcate black oaks of to-day.

The conclusion seems unavoidable for the present that though seemingly of a more primitive type than Leucobalanus, the American group Erythrobalanus is really more modern and of American origin. In this belief, and paralleling the *Palaeo-Ilex* derivation of European white oaks, I am compelled to think that all of the existing American oaks have come from a single primitive stock of the holly-oak type, represented by the mid-Tertiary oak that has been referred to the existing *Q. chrysolepis*, and out of which in Pliocene and later time have been developed the multiplicity of species that make this continent preeminent in its oak flora.

A corollary of this conclusion is that the most variable oaks of to-day do not represent species in the usual acceptance of the word, but that each polymorphic species like *Q. alba*, *Q. marilandica*, *Q. stellata*, *Q. velutina*, etc., is comparable with divisible aggregates like the Dumosae, Gambelieae, etc., on the one hand, and with variable aggregates like the Robur assemblage on the other. In fact it is to be considered a protean group of mutants apparently transmitting their characters by seed but freely intercrossing so as to blend and confuse these interminably, so that, as De Vries has expressed it for the cereals, with them what is called extreme variability is rather extreme polymorphy. Within the limits of such polymorphy Quercus has proved closely comparable with other groups of plants known from the period of glaciation, in the persistence to the present time of most species—in marked contrast with the disappearance from the present fauna of a very high percentage of Pleistocene animals.

On this assumption of a common derivation of all existing American oaks, their primary center of distribution appears to have been in what is now Arizona. From this, lines of migration radiated to the south where the largest number of forms has originated, among them apparently the ancestral stock of the black oaks of the eastern United States; to the east, with development of our many characteristic white oaks; to the north, giving rise to the more closely related mountain species centering about *Q. undulata;* and to the west, where, in California, the intermediate oaks are now found chiefly and where few but very polymorphic forms of both white and black oaks occur, not obviously related to those of the east.

DESCRIPTIVE TREATMENT.

THE GENUS QUERCUS.

Exogenous shrubs or mostly trees, often of large size. Pith star-shaped, continuous. Wood usually hard with both thick and fine medullary rays; ducts grouped in coarse radial masses of wood-parenchyma with finer tangential connections, in deciduous species crowded and relatively large in the spring growth, often plugged by tyloses. Buds crowded toward the end of the mostly fluted twigs, occasionally with collateral supernumeraries. Leaves alternate, mostly distinctly petioled, simple, entire or toothed or pinnately lobed or incised, with usually caducous linear stipules. Flowers in elongated or (for the pistillate) reduced catkins, monoecious by abortion, apetalous; the staminate with some 5 bractlike more or less connate sepals and 5 to 10 free stamens with short anthers and slender filaments; the pistillate with 6 sepals adherent to the

base of the 3 styles, surmounting the tardily developed 3-carpellary 1-celled 6-ovuled ovary. Fruit a solitary terete nut (acorn) attached by a large base within a scaly cupule, containing a single exalbuminous seed with large fleshy plane cotyledons.—*Quercus* Linnaeus, Genera Plantarum, 5 ed., p. 431, 1754.—*Cerris* Rafinesque, Alsographia Americana, p. 29, 1838.—*Scolodrys* Rafinesque, *l. c.*

SUBGENERA OR SECTIONS.

Styles linear: fruit not tomentose within: abortive ovules basal.
- Fruit annual. Asia.....HETEROBALANUS.
- Fruit biennial. Orient. (Wood section, pl. 6).....CERRIS.

Styles spatulate-elongated; fruit tomentose within; abortive ovules apical (except in the Durifoliae, Scytophyllae, Costaricenses and Andinae).
- Scales of cup in distinct rings. Asia.....CYCLOBALANOPSIS.
- Scales of cup imbricated. North America. (Wood sections, pls. 8, 9).....ERYTHROBALANUS.

Styles short, broad and spreading; abortive ovules deeply lateral or basal.
- Fruit tomentose within. North America. (Wood sections, pl. 9).....PROTOBALANUS.
- Fruit not tomentose within. North America and Europe. (Wood sections, pls. 6–8).....LEUCOBALANUS.

EXISTING AMERICAN OAKS.

SYSTEMATIC ENUMERATION OF SPECIES.[1]

LEUCOBALANUS—WHITE OAKS.

	Region.	Plate.
INSIGNES.		
Q. insignis	E. Sierra	14 to 16
f. strombocarpoides.		
strombocarpa	E. Sierra	16, 17
OOCARPAE.		
Q. oocarpa	C. Amer.	18
Pilarius	C. Amer.	19
comasaguana	C. Amer.	
CYCLOBALANOIDEAE.		
Q. cyclobalanoides	C. Amer.	20, 21
CORRUGATAE.		
Q. Reevesii	C. Amer.	22
corrugata	C. Amer.	23
v. ipalensis.		
v. granulifera		24
f. microcarpa.		
Galeottii	E. Sierra	25, 26
Pilgeriana	C. Amer.	27
EXCELSAE.		
Q. pinalensis	W. Sierra	28
chinantlensis	E. Sierra	28
excelsa	E. Sierra	29, 30
LANCIFOLIAE.		
Q. leiophylla	E. Sierra	31
f. subintegra.		
lancifolia	E. Sierra	32
f. pilosiuscula		32
toxicodendrifolia	Table	33
BOQUERONAEAE.		
Q. boqueronae	C. Amer.	33
GLABRESCENTES.		
Q. glabrescens	Table	34
f. integrifolia		34
Radlkoferiana	Cordill.	35
POLYMORPHAE.		
Q. polymorpha	E. S. & C. Am.	36 to 38
Juergensenii	Cordill.	38
porphyrogenita	E. Sierra	39
GERMANAE.		
Q. germana	E. Sierra	40
f. echinata.		
v. Lemmoni.		
STENOBALANEAE.		
Q. substenocarpa	E. Sierra	41
GLAUCOIDEAE.		
Q. glaucoides	Cordill.	42, 43
baldoquinae	W. Sierra	43
glaucophylla	Cordill.	44
f. tlacolulana		45
mixtecana	Cordill.	46
sororia	Cordill.	47
Harmsiana	W. Sierra	45
CANCELLATAE.		
Q. conjungens	Table.	48
cancellata	Cordill.	49
GLAUCESCENTES.		
Q. glaucescens	W. Sierra	50
TUBERCULATAE.		
Q. tuberculata	W. Sierra	51
idonea	L. Calif.	51
subspathulata	W. Sierra	52
crenatifolia	W. Sierra	52
AURANTIACAE.		
Q. aurantiaca	W. Sierra	53
Standleyi	W. Sierra	53
SEGOVIENSES.		
Q. segoviensis	C. Amer.	54
matagalpana	C. Amer.	54
VINCENTENSES.		
Q. vincentensis	C. Amer.	
ARACHNOIDEAE.		
Q. arachnoidea	C. Amer.	55
PRINOPSES.		
Q. Rekonis	Cordill.	57
Martensiana	E. Sierra	56, 58
f. perplexans.		
f. Berlandieri.		

[1] The following species named by Rafinesque, though sometimes said to be American, are clearly stated by their author to be European:—Q. *corticosa* (Mediterranean), *dispar* (near the Rhine), *durinus* (France), *nigrescens* (Europe.)

LEUCOBALANUS—WHITE OAKS—Continued.

PRINOPSES—Continued.	Region.	Plate.
Q. prinopsis	Table.	58
chartacea	Cordill.	59
centralis	Cordill.	60
f. heterophylla.		
PANDURATAE.		
Q. obtusata	W. Sierra	62
v. pandurata		61
panduriformis	W. Sierra	62, 63
f. rubrinervis.		
f. colimensis		63
MACROPHYLLAE.		
Q. purulhana	C. Amer.	64
macrophylla	W. Sierra	65 to 67
resinosa	W. Sierra	68
POCULIFERAE.		
Q. Poculifer	Cordill.	69
CIRCINATAE.		
Q. nudinervis	W. Sierra.	70
circinata	W. S. & Table.	71
magnoliaefolia	W. Sierra.	72
lutea	W. Sierra.	73
haematophlebia	W. Sierra.	74
Liebmannii	Cordill.	75
f. brevipes		75
PEDUNCULARES.		
Q. Barbeyana	C. Amer.	76
pilicaulis	C. Amer.	77
f. macrodonta		78
f. obovalis		79
f. Hurteri		80
f. armata		79
barbanthera	C. Amer.	81
v. calva.		
callosa	C. Amer.	82
peduncularis	W. Sierra.	83, 86
LAXAE.		
Q. Hartwegi	W. Sierra.	84
f. glabrata		
laxa	W. Sierra.	85
LAETAE.		
Q. laeta	Cordill.	86
f. heterophylla		87
OBSCURAE.		
Q. obscura	W. Sierra.	88
v. perpusilla		89
transmontana	W. Sierra.	89
v. lata.		
RETICULATAE.		
Q. vellifera	W. Sierra.	90
durangensis	W. Sierra.	91
diversicolor	W. Sierra.	92, 93
v. socorronis.		
v. Mearnsii		94
rhodophlebia	W. Sierra.	95
f. concava		95
f. crenata.		
f. applanata		96
f. apus		96
f. inclusa		97
ariaefolia	Table.	97
reticulata	Table.	98

RETICULATAE—Continued.	Region.	Plate.
Q. f. Dugesi		98
f. longa		99
f. squarrosa		99
Uhdeana	Table.	100
rugosa	Table.	101, 102
Bonplandiana	Table.	103
alvarezensis	Table.	104
Purpusi	Cord. & W. S.	105
conglomerata	Cordill.	106
decipiens	E. Sierra.	106, 107
innuncupata	W. Sierra.	108
REVOLUTAE.		
Q. Greggii	E. Sierra.	109
aculcingensis	Cordill.	110
revoluta	Cordill.	111
f. dysophyllopsis		112
Loeseneri	E. Sierra.	110
DESERTICOLAE.		
Q. diversifolia	Table.	
deserticola	Table.	113
v. incisa		114
alveolata	Cordill.	114
LECOMTEANAE.		
Q. manzanillana	Cordill.	116
Lecomteana	E. Sierra.	115
vallicola	Cordill.	116
texcocana	Table.	117
v. ampla		117
subtriloba	Table.	118
MICROPHYLLAE.		
Q. microphylla	Table.	119
Frutex	Cordill.	120
v. Uhdeana.		
alpescens	Table.	122
repanda	Table.	121, 122
POTOSINAE.		
Q. potosina	Table.	123
f. exilis		124
f. aperta		125
cordifolia	E. Sierra.	125
INTRICATAE.		
Q. intricata	E. Sierra.	126, 127
f. angusta		127
f. ovata		128
f. erratica		128
CHIHUAHUENSES.		
Q. chihuahuensis	W. Sierra.	129, 130
f. microphylloides		130
f. tenuis		131
f. amplifolia		131
jaliscensis	W. Sierra.	132
jaralensis	Chihuah.	133, 134
f. Berlandieri		134
undata	W. Sierra.	135
infralutea	W. Sierra.	136
INVAGINATAE.		
Q. invaginata	Chihuah.	137, 138
f. Purpusiana		138
ARIZONICAE.		
Q. Praeco	W. Sierra.	139
convallata	W. Sierra.	140

LEUCOBALANUS—WHITE OAKS—Continued.

ARIZONICAE—Continued.	Region.	Plate.
Q. arizonica	W. Sierra.	141
v. Wootoni.		
pallescens	W. Sierra.	141
Sacame	W. Sierra.	142
bipedalis	W. Sierra.	143
Mohriana	R. Mt.	143
DEPRESSIPEDES.		
Q. depressipes	W. Sierra.	144
OBLONGIFOLIAE.		
Q. Engelmanni	Calif.	144
oblongifolia	W. Sierra.	145, 146
f. pallidinervis		146
perpallida	W. Sierra.	147
OPACAE.		
Q. Pringlei	E. Sierra.	148
opaca	Table.	148
sebifera	C. Amer.	149
v. comitanensis		149
Schenckiana	Cordill.	150
ceripes	Cordill.	150
STRIATULAE.		
Q. striatula	W. Sierra.	151
f. otinapensis		152
GRISEAE.		
Q. grisea	Chihuah.	152
UNDULATAE.		
Q. Toumeyi	W. Sierra.	153
subturbinella	W. Sierra.	153
Hartmani	W. Sierra.	154
Rydbergiana	R. Mt.	155
undulata	R. Mt.	155
f. Vaseyana		156
v. pungens		157
CONFUSAE.		
Q. venustula	R. Mt.	158
Havardi	R. Mt.	160
confusa	R. Mt.	161
Fendleri	R. Mt.	159
pauciloba	R. Mt.	160
GAMBELIEAE.		
Q. Eastwoodiae	R. Mt.	162
utahensis	R. Mt.	158
obtusifolia	R. Mt.	162
submollis	R. Mt.	163
leptophylla	R. Mt.	163
media	R. Mt.	161
nitescens	R. Mt.	164
novomexicana	R. Mt.	165
f. Andrewsi		164
Gambelii	R. Mt.	158
Gunnisonii	R. Mt.	166
Vreelandii	R. Mt.	166
LOBATAE.		
Q. lobata	Calif.	168
Garryana	Calif.	167, 168
Oerstediana	Calif.	168
DURANDIEAE.		
Q. sinuata	Atl.	170
f. Durandii		171
breviloba	Atl.	169
f. Laceyi.		

DURANDIEAE—Continued.	Region.	Plate.
Q. sinuata f. san-sabia	Atl.	
f. argentata		170
sillae	E. Sierra.	171
ALBAE.		
Q. alba	Atl.	172
f. repanda		173
f. heterophylla		172, 174, 175
f. Ryderi		172
f. viridis		
f. latiloba		173
f. microcarpa.		
f. sublyrata		173, 174
f. longigemma.		
STELLATAE.		
Q. stellata	Atl.	179, 181, 182
f. laevis.		
f. mollissima.		
f. tonsa.		
f. quadrata		180
f. Sterretti		180
f. attenuata		178
f. Houbae.		
v. Palmeri		178
f. oblonga		179
f. paludosa		178
f. rufescens		177
f. reducta.		
f. cruciformis		177
f. parviloba		177
f. anomala		177
Margaretta	Atl.	176
f. intermedia.		
f. araniosa.		
f. stolonifera.		
f. Peltieri.		
Boyntoni	Atl.	176
Chapmani	Atl.	176
LYRATAE.		
Q. lyrata	Atl.	183
f. viridis.		
MACROCARPAE.		
Q. macrocarpa	Atl.	184, 185
f. orbiculata		184
f. muscosa.		
f. monstrosa.		
f. explanata.		
f. Fisherii.		
v. olivaeformis.		
f. abbreviata.		
f. minor.		
f. depressa.		
f. appressa.		
bicolor	Atl.	186
f. mollis.		
PRINOIDEAE.		
Q. Brayi	Atl.	
Prinus	Atl.	187
f. viridis.		
montana	Atl.	187
Muehlenbergii	Atl.	187
f. stellulata.		
prinoides	Atl.	187

LEUCOBALANUS—WHITE OAKS—Continued.

SADLERIANAE.	Region.	Plate.
Q. Sadleriana	Calif.	188
DOUGLASIEAE.		
Q. Douglasii	Calif.	188
VIRENTES.		
Q. virginiana	Atl.	189
v. macrophylla		190
v. virescens		190
v. Sagraeana	Antill.	189
oleoides	E. Sierra.	191, 192
f. lutescens		194
f. australis	C. Amer.	192, 193
fusiformis	E. Sierra.	195
Brandegei	L. Calif.	196, 197
geminata	Atl.	
v. grandifolia		198
f. maritima		198
f. Rolfsii		200
f. succulenta		199

VIRENTES—Continued.	Region.	Plate.
Q. minima	Atl.	201
f. pygmaea		201
f. Reasoneri		200
Andromeda	Atl.	202
f. nana		202
DUMOSAE.		
Q. durata	Calif.	
dumosa	Calif.	
f. microcarpa		203
f. diversifolia		205
f. Alvordiana.		
v. turbinella		206
f. berberidifolia	Calif.	207, 208
f. crispata		208
f. populifolia		204
v. acutidens		204
f. linearis		205
v. MacDonaldi		203

PROTOBALANUS—Intermediate Oaks.

CHRYSOLEPIDES.	Region.	Plate.
Q. chrysolepis	Calif.	209, 210
tomentella	Pac.	211, 212
f. conjungens	Calif.	

CHRYSOLEPIDES—Continued.	Region.	Plate.
Q. Palmeri	Calif.	213, 214
Wilcoxii	W. Sierra.	215
vaccinifolia	Calif.	210

ERYTHROBALANUS—Red Oaks.

DURIFOLIAE.	Region.	Plate.
Q. Emoryi	W. Sierra.	216, 217
durifolia	W. Sierra.	218
OLIGODONTAE.		
Q. Eduardi	W. Sierra.	219
f. cespitifera		219
NITIDISSIMAE.		
Q. nitidissima	Table.	218
VIMINEAE.		
Q. Duraznillo	W. Sierra.	220
f. bullata		221
f. pinetorum		221
f. cochutensis.		
balsequillana	W. Sierra.	220
viminea	W. Sierra.	222
bolanyosensis	W. Sierra.	223
PENINSULARES.		
Q. devia	L. Calif.	224
peninsularis	L. Calif.	225
HYPOLEUCAE.		
Q. hypoleuca	W. Sierra.	226
SCYTOPHYLLAE.		
Q. scytophylla	Cordill.	227
epileuca	W. Sierra.	229
campanariensis	W. Sierra.	228
incarnata	W. Sierra.	230
f. longa		230
f. grosse-serrata		231
f. ampla		229
omissa	W. Sierra.	231
FLOCCOSAE.		
Q. floccosa	E. Sierra.	232
ORIZABAEAE.		
Q. orizabae	E. Sierra.	233

CRASSIFOLIAE.	Region.	Plate.
Q. crassifolia	Table.	234
fulva	W. Sierra.	235, 236
felipensis	Cordill.	237
brachystachys	C. Amer.	238, 239
f. venulosa		240
f. caerulea		240
moreliana	W. Sierra.	241
stipularis	Table.	242–244
errans	Table.	245
chicamolensis	Cordill.	246
Hahnii	Table.	247
esperanzae	Table.	248
orbiculata	Table.	249
miguelitensis	Table.	249
dysophylla	Table.	250, 251
splendens	W. Sierra.	252
RACEMIFLORAE.		
Q. Urbani	W. Sierra.	253
radiata	W. Sierra.	253
Conzattii	Cordill.	254
PENNIVENIAE.		
Q. tepicana	W. Sierra.	255
pennivenia	W. Sierra.	256
AEREAE.		
Q. aerea	W. Sierra.	257
COCCOLOBAEFOLIAE.		
Q. coccolobaefolia	Table.	258
Jonesi	W. Sierra.	257
PLANIPOCULAE.		
Q. planipocula	W. Sierra.	259
f. subsessilifolia.		
Rosei	W. Sierra.	260

ERYTHROBALANUS—RED OAKS—Continued.

	Region.	Plate.
PRAINEANAE.		
Q. coffeaecolor	W. Sierra.	261
aequivenulosa	W. Sierra.	261
Praineana	W. Sierra.	262
LANGLASSEIAE.		
Q. Langlassei	W. Sierra.	263
chiquihuitillonis	W. Sierra.	264
ARISTATAE.		
Q. aristata	W. Sierra.	265
productipes	W. Sierra.	264
exaristata	W. Sierra.	266
hondurensis	C. Amer.	266
Endlichiana	W. Sierra.	267
ANDINAE.		
Q. amphioxys	C. Amer.	268
almaguerensis	And.	268, 269
tolimensis	And.	270, 271
Humboldtii	And.	272, 273
f. Lehmanniana	And.	273
Lindeni	And.	274
RAPURAHUENSES.		
Q. rapurahuensis	C. Amer.	275
URUAPANENSES.		
Q. uruapanensis	W. Sierra.	276
trinitatis	Table.	277
RYSOPHYLLAE.		
Q. irazuensis	C. Amer.	278
rysophylla	E. Sierra.	279
ENDRESIAE.		
Q. Endresi	C. Amer.	280
COSTARICENSES.		
Q. costaricensis	C. Amer.	281, 282
f. Kuntzei		283
BENTHAMIAE.		
Q. Benthami	C. Amer.	284
Tonduzii	C. Amer.	285
CRISPIFOLIAE.		
Q. crispifolia	C. Amer.	286
PACHYPHYLLAE.		
Q. incrassata	C. Amer.	287
CITRIFOLIAE.		
Q. citrifolia	C. Amer.	288
NECTANDRAEFOLIAE.		
Q. nectandraefolia	E. Sierra.	289
lingvaefolia	Cordill.	290
PERSEAEFOLIAE.		
Q. sapotaefolia	C. Amer.	291
bumelioides	C. Amer.	291
perseaefolia	E. Sierra.	292, 293
f. microcarpa.		
OAJACANAE.		
Q. pubinervis	E. Sierra.	294
oajacana	Cordill.	294
botryocarpa	W. Sierra.	295
SYNTHETICAE.		
Q. synthetica	E. Sierra.	297
v. crenifolia		296
TOTUTLENSES.		
Q. totutlensis	E. Sierra.	297

	Region.	Plate.
PARVIGLANDES.		
Q. parviglans	C. Amer.	298
f. polycarpa		299
f. Tejadana.		
apanecana	C. Amer.	
gemmata	C. Amer.	299
GUATIMALENSES.		
Q. guatimalensis	C. Amer.	300
correpta	C. Amer.	300
SALICIFOLIAE.		
Q. acapulcensis	W. Sierra.	302
salicifolia	W. Sierra.	301
tahuasalana	W. Sierra.	302
LAURIFOLIAE.		
Q. pumila	Atl.	303
cinerea	Atl.	303
f. dentato-lobata		303
imbricaria	Atl.	303
f. spinulosa.		
laurifolia	Atl.	304
f. arenaria.		
f. obtusa		304
f. tridentata		304, 305
f. dentata		306
f. rhombica		304, 305
f. obovatifolia		306
myrtifolia	Atl.	303
f. ampla.		
Phellos	Atl.	303
f. microcarpa.		
f. latifolia.		
f. arachnoidea.		
PALUSTRES.		
Q. palustris	Atl.	307
f. heterophylla.		
georgiana	Atl.	307
NIGRAE.		
Q. nigra		308
f. megacarpa.		
f. tridentifera.		
f. hemisphaerica		310–314
f. plenocarpa		309
f. microcarya		309
f. saxicola		309
BORUCASANAE.		
Q. borucasana	C. Amer.	315
EUGENIAEFOLIAE.		
Q. eugeniaefolia	C. Amer.	316
f. petiolata		316
Seemanni	C. Amer.	317
ACATENANGENSES.		
Q. Donnell-Smithii	C. Amer.	318
flagellifera	C. Amer.	319
acatenangensis	C. Amer.	320
CAERULEOCARPAE.		
Q. caeruleocarpa	Cordill.	321
Ghiesbreghtii	E. Sierra.	321, 322
ZEMPOALTEPECANAE.		
Q. zempoaltepecana	Cordill.	323

ERYTHROBALANUS—RED OAKS—Continued.

LANCEOLATAE.	Region.	Plate.
Q. cuajimalpana	Cordill.	324
tlapuxahuensis	W. Sierra.	325
v. obconica.		
lanceolata	Table.	326
laurina	Table.	327–329
major	E. Sierra.	330
barbinervis	Table.	331
affinis	Table.	332
f. commutata		333
f. subintegra		333
ocoteaefolia	Cordill.	334
f. podocarpa		335
f. confusa		335
Bourgaei	Cordill.	336
v. ilicifolia		336
DEPRESSAE.		
Q. depressa	Table.	337, 338
subavenia	Cordill.	338
SIDEROXYLAE.		
Q. sideroxyla	Table.	339
f. aquifolia.		
f. ciliifera.		
HYPOXANTHAE.		
Q. hypoxantha	E. Sierra.	339
TRIDENTES.		
Q. chrysophylla	Table.	340
tridens	Table.	340
TRISTES.		
Q. tristis	C. Amer.	341
f. mixcoensis.		
f. Niederleini		343
f. sublobata		342
f. vulcani		342
Scherzeri	C. Amer.	343
CONSOCIATAE.		
Q. Wesmaeli	C. Amer.	344
consociata	C. Amer.	345
MEXICANAE.		
Q. mexicana	Table.	346
f. angustifolia		345
f. glabrata.		
f. confertifolia.		
f. Bonplandi		347
f. lanosa		347
imbricariaefolia	Table.	348
colimae	W. Sierra.	349
f. Zauzillo		349
crassipes	Table.	350, 351
malifolia	Table.	348
obovalifolia	Cordill.	351
axillaris	Cordill.	352
subcrispata	Cordill.	353
LANIGERAE.		
Q. lanigera	Cordill.	354
f. sideroxyloides		355
circummontana	E. Sierra.	356
FOURNIERIAE.		
Q. Fournieri	E. Sierra.	357
CASTANEAE.		
Q. castanea	Table.	358
v. elliptica		359

CASTANEAE—Continued.	Region.	Plate.
Q. pulchella	Table.	360
serrulata	W. Sierra.	361
alamosensis	W. Sierra.	361
Rossii	W. Sierra.	362
f. Arsenei.		
tepoxuchilensis	Cordill.	363
f. perplexans.		
simillima	Table.	363
IMPRESSAE.		
Q. impressa	Cordill.	364
RUGULOSAE.		
Q. Seleri	W. Sierra.	364
rugulosa	Table.	365
f. subtruncata.		
roseovenulosa	Table.	366
Sipuraca	W. Sierra.	366
SALTILLENSES.		
Q. acherdophylla	Cordill.	367
saltillensis	E. Sierra.	368, 369
carnerosana	E. Sierra.	369
CRISPIPILES.		
Q. cerifera	C. Amer.	370
crispipilis	C. Amer.	370
CINNAMOMEAE.		
Q. cinnamomea	C. Amer.	371
GRANDES.		
Q. grandis	C. Amer.	372
v. tenuipes	Cordill.	373
HUITAMALCANAE.		
Q. Cortesii	E. Sierra.	373
huitamalcana	Cordill.	374
chiapasensis	C. Amer.	376–377
f. falcilobata		375
f. flagellata.		
f. cuneifolia.		
f. subcuneata.		
f. petiolata.		
f. longipes.		
BRENESIEAE.		
Q. Brenesii	C. Amer.	377
SKINNERIAE.		
Q. Skinneri	C. Amer.	378
ACUTIFOLIAE.		
Q. Canbyi	E. Sierra	379
f. adscendens		380
f. Berlandieri		380
Karwinskii	E. Sierra	379
Sartorii	E. Sierra	381
f. magna.		
furfuracea	Cordill.	382
Grahami	Cordill.	383
v. Nelsoni		384
f. brevipes		384
v. coyulana.		
tonaguiae	E. Sierra	385
vexans	E. Sierra	386
Candolleana	E. Sierra	387
conspersa	C. Amer.	388, 389
f. ovatifolia		389
f. caudata.		
acutifolia	W. Sierra	390, 391

ERY THROBALANUS—RED OAKS—Continued.

ACUTIFOLIAE—Continued.	Region.	Plate.
Q. acertifolia v. angustifolia		391
f. abrupta.		
xalapensis	E. Sierra	392
f. jalapae		393
f. surculina		393
ALBOCINCTAE.		
Q. albocincta	W. Sierra	394
COCCINEAE.		
Q. Shumardii	Atl.	395
maxima	Atl.	395
borealis	Atl.	
f. Lowellii.		
texana	Atl.	396
v. chesosensis.		
v. stellapila.		
coccinea	Atl.	396
v. tuberculata.		
ellipsoidalis	Atl.	396
f. incurva.		
f. intermedia.		
f. depressa.		
f. coronata.		
f. heterophylla.		
ILICIFOLIAE.		
Q. ilicifolia	Atl.	397
VELUTINAE.		
Q. velutina	Atl.	398
f. dilaniata		399
f. pagodaeformis		398
f. macrophylla.		
f. acuta.		
f. missouriensis.		
f. magnifica.		
f. nobilis.		
f. angulosa		399
f. obovata.		
f. sinuosa.		
MARILANDICAE.		
Q. marilandica	Atl.	400
f. integriloba.		
f. aequilobata		400
f. paucidentata		400
f. incisa		402
f. truncata		402
f. sublyrata		402

MARILANDICAE—Continued.	Region.	Plate.
Q. marilandica f. subtypica		401
f. cuneata		401
f. obovata		401
f. subquinqueloba		403
f. quinqueloba		403
laevis	Atl.	404
f. linearilobata		405
f. Rappii		405
PAGODAEFOLIAE.		
Q. rubra	Atl.	406
f. falcata		406
f. triloba		406
f. cuneata		406
f. juvenilis.		
f. Houbae.		
f. obovata.		
Pagoda	Atl.	407
f. incurva.		
f. juvenilis		408
f. sinuata		407
f. leucophylla		407
f. intermedia		407
f. cocciniaefolia		407
f. calva		407
CALOPHYLLAE.		
Q. calophylla	E. Sierra.	409, 410
f. Schiedeana.		
f. Willdenovii		411, 412
f. flavida		412
f. acuminata		413, 414
f. intermedia		415
f. Alamo		416
candicans	W. Sierra.	417
f. michoacana		418
f. incurva		418
AGRIFOLIAE.		
Q. Kelloggii	Calif.	419
f. cibata.		
Wislizeni	Calif.	419
f. extima.		
v. frutescens.		
f. parvula.		
agrifolia	Calif.	420
v. frutescens.		
Pricei	Calif.	420

REVISION.

LEUCOBALANUS. THE WHITE OAKS.

LEUCOBALANUS.

Stamens rather numerous (about 7–9) with mostly short rounded emarginate anthers; styles short with dilated stigmas; fruit (when known) always maturing the first season, frequently long peduncled; abortive ovules always near or at its base, more or less immersed in tomentum, often remaining in the otherwise internally nearly glabrous shell when the ungrooved seed is removed; scales of the cup usually taper pointed, often thickened at base or on the back or woolly; leaves often round lobed, never truly aristate even from the tip, though sometimes sharply serrate or pungently mucronate from the veins.

Shrubs or trees, often of the largest size, with mostly rough, sometimes scaly gray bark and close hard pale wood, the larger ducts of which are commonly plugged by tyloses.

Throughout North America, Europe, and temperate Asia; one species in the West Indies. The typical section of the genus Quercus, of which *Quercus Robur* is taken as type.—White Oaks.

INSIGNES.—Very large trees with stout villous or almost hirsute twigs, round-ovoid or angular buds, persistent stipules, rather large elliptical-lanceolate or oblanceolate mostly low-serrate glabrescent somewhat pinnately or reticulately impressed leaves, and annual nearly sessile large fruit with coarse acuminate tomentose scales.—Eastern Sierra Madre region of Mexico.[7]

Acorn blunt, depressed.....*Q. insignis.*
Acorn acute, conical-ovoid.....*Q. strombocarpa.*

QUERCUS INSIGNIS Martens and Galeotti.

Plates 14 to 16.

Quercus insignis Martens & Galeotti, Bull. Acad. Brux., vol. 10, part 1, p. 219, 1843.—Liebmann-Oersted, Chênes Amér. Trop., pl. K, 20.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 25.—U. S. Dept. Agriculture, Inventory of Seeds & Plants Imported, no. 44, pl. 11.

Twigs stout (4–6 mm.), little fluted, tawny-villous, light buff with rather prominent lenticels when denuded. Buds brown, glabrous, somewhat angularly ovoid, 5×10 or the terminal 7×15 mm., with rather persistent stipules. Leaves deciduous, oblanceolate-obovate, rather acuminately obtuse, the attenuated base rather rounded, subentire to undulate or typically serrate above, with the teeth sometimes incurved, somewhat revolute, large (4–7× 9–16 cm.), glossy, glabrescent above except along the midrib, paler and slightly hairy at least along the principal veins beneath; veins about 18×2, scarcely looped, the secondaries deeply impressed above and salient beneath; petiole tomentose, 2×5 to typically 10–20 mm. Catkins ?. Fruit annual; cup saucer-shaped or deeper, extremely large (50–80 mm. in diameter), with coarse heavy squarrose pointed yellow-tomentose scales; acorn depressed and blunt, thick-walled, 50–70 mm. in diameter, typically covered to or beyond the middle, for a time yellow- or gray-tomentose.

Transition zone of the Eastern Sierra Madre region of Mexico, at 2,500 to 3,000 m.—A gigantic tree with the clustered leaves resembling foliage of the horse chestnut, and enormous acorns sometimes weighing fully 50 grams each.

Specimens examined.—Pic d'Orizaba (*Galeotti, 123*, 1840—the type, and, without data, *121* and *124;* also *125*, noted as from an altitude of 900 m.). S. Antonio Huatusco (*Liebmann, 3493*), Huatusco (*Purpus, 7386*), S. Bartolomé (*Liebmann, 3492*), Matlaluga (*Liebmann, 3494*), Zacuapam (*Purpus, 697*, and fruit without number). Cultivated at Kew (*Nicholson, 3152*).

QUERCUS STROMBOCARPA Liebmann.

Plates 16 and 17.

Quercus strombocarpa Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 176.—Liebmann-Oersted, Chênes Amér. Trop., p. 24, pl. 27.—Oersted, Bidrag Kundsk. Egefamil., p. 346, f. E.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 25.

?*Q. insignis strombocarpoides* Liebmann-Oersted, *l. c.* pl. 28, 1869.

Twigs rather stout (4–5 mm.), little fluted, tawny-hirsute, gray-buff with scarcely conspicuous lenticels. Buds glossy brown or the lower scales gray, glabrous, ovoid, at length angular, 3–4×5–10 mm. Leaves elliptical-obovate, obtuse to acute or very slightly acuminate, rounded at base, shallowly serrate above the middle, somewhat crisped and rather valleculate between the main veins, slightly revolute, large (6–9×14–17 cm.), glossy, glabrous above except along the midrib, scarcely paler and sparingly pilose beneath; veins about 18×2, scarcely looped; petiole tawny-pilose, 2×10 mm. Catkins ?. Fruit annual; cup shallow-turbinate, very large (50 mm. in diameter), with coarse heavy spreading or upcurved pointed yellow-tomentose scales; acorn acutely conical, very thick-walled, 40–50 mm. in diameter, the lower third included.

[7] This and the next two groups constitute the section Macrocarpaea of Oersted (Liebmann-Oersted, Chênes Amér. Trop., pp. 16-17), with unequal cotyledons and lateral radicle.

Transition zone of the Eastern Sierra Madre region of Mexico.—A large tree.

Specimens examined.—San Bartolomé, between Huatusco and Jalapa, at 1,400 m. (*Liebmann, 174–7, 3563*, November, 1841—the types).

It is hard to see how *Q. insignis strombocarpoides* as figured by Oersted is distinguishable; no description of it or specimen referred to it has been seen, but it may be what had been mentioned as questionable *insignis* by de Candolle a few years previously (Prodromus, vol. 16, part 2, p. 25). In the museum at Budapest, with one label, occur fruits (pl. 16) of *insignis*, collected by Galeotti and so named by Martens and Galeotti, and of what I should take for *strombocarpa*. These may be what the name *Q. insignis strombocarpoides* stands for.

OOCARPAE.—Large trees with rather stout for a time hairy twigs, ovoid buds, persistent stipules, rather large oblanceolate nearly sessile coarsely serrate glabrescent pinnately impressed leaves and annual? subsessile? large round fruit with thin pointed appressed tomentose scales.—Central American region.

Acorns small for the group (30 mm.).....*Q. oocarpa.*
Acorns very large (50 mm.).....*Q. Pilarius.*
Acorn unknown: leaves elliptic-oblong.....*Q. comasaguana.*

QUERCUS OOCARPA Liebmann.

Plate 18.

Quercus oocarpa Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 184.—Liebmann-Oersted, Chênes Amér. Trop., p. 25.

Q. Warscewiczii Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 187.—Liebmann-Oersted, Chênes Amér. Trop., p. 26, pl. 30.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 65.

Twigs rather stout (3–5 mm.), little fluted, tawny-hirsute, light buff with prominent lenticels of the same color when denuded. Buds with persistent slender villous stipules. Leaves deciduous?, oblanceolate, often caudately acuminate, the attenuated base rather rounded, serrate above, very slightly revolute, large (6–11 × 16–30 cm.), glossy, little paler beneath, glabrous or both faces more or less appressed-hairy; veins about 15–20 × 2, running into the callous-tipped teeth, scarcely looped, the larger impressed; petiole villous, 3 × 4 mm., usually with oblong brown stipules. Catkins: ♂, 60 mm. long, reddish-tomentose, rather loosely flowered, the glabrous rounded small anthers scarcely exserted. Fruit annual?; cup half-round or cup-shaped, very large (35 mm. in diameter), with rather thin appressed acuminate gray-tomentose scales; acorn short-ovoid, 30 mm. long, less than half included.

Central American region.

Specimens examined.—Guatemala. Without locality (*v. Warscewicz, 50 a*—the type at once of *Q. oocarpa* and *Q. Warscewiczii*, in the Berlin herbarium); in the Candollean herbarium, fruit of *Q. oocarpa* associated with foliage of *Q. grandis* occurs as *von Warscewicz, no. 44*; Finca Sepacuite (*Cook & Griggs, 572*); Valley of Sta. Rosa (*Cook, 220*). Costa Rica. Rio Navarrito (*Pittier, 2378*); San Lorenzo (*Pttier*); Tremedal, S. Ramon (*Tonduz, 17693*); without locality (*Huebsch*). Panama. Veraguas (*Seemann, 1130, 1230, 1572*).

Quercus comasaguana n. sp.

Twigs moderate (2–3 mm.), fluted, vary quickly glabrous, gray with prominent white lenticels. Buds apparently glabrous, glossy brown, and round-ovoid. Leaves persisting till the new growth is formed, elliptical-oblong, subacute, cordulate, coarsely crenate-serrate above the middle, slightly revolute, rather large (2.5–3 × 6–9, or 6 × 16 cm.) glossy, glabrous and somewhat inpressed-reticulate above, dull, pale and rather persistently cobwebby beneath; veins about 15 × 2, forked and somewhat looped; petiole glabrate, about 2 × 6 mm. Catkins and fruit?

Central American region.—Called roble negro.

Specimens examined—El Salvador. Comasagua (*Calderon, 1430*, Dec., 1922, the type).

Quercus Pilarius n. sp.

Plate 19.

Twigs and buds?. Leaves deciduous, oblanceolate-oblong, pointed, the long-attenuate base rather rounded, coarsely serrate above with mucronate teeth, scarcely revolute, large (2–6×13–20 cm.), rather glossy, little paler beneath, glabrescent; veins about 15×2, running into the teeth, not looped, the larger impressed; petiole villous, 2×4 mm. Catkins? Fruit annual?; cup?; acorn subglobose, very large (40 mm. long and 50 mm. in diameter), about one-third included.

Central American region.

Specimens examined.—Mexico. Finca San Juan las Chicharras, Tapachula, Chiapas (*Reeves, 11*, 1918, the type).

Closely related to *Q. oocarpa*, from which it differs in its narrower leaves and much larger fruit.

CYCLOBALANOIDEAE.—Large trees with stout glabrate twigs, round-ovoid buds without persistent stipules, large oblanceolate coarsely serrate glabrescent raised-venulose leaves, and annual somewhat stalked large conical-ovoid fruit with scales confluent in rings encircling the cup.—Central American region.

Leaves cuneate.....*Q. cyclobalanoides.*

QUERCUS CYCLOBALANOIDES Trelease.

Plates 20 and 21.

Quercus cyclobalanoides Trelease, Proc. Amer. Philos. Soc., vol. 54, p. 11, pl. 3, 1915.
Q. insignis Journ. of Heredity, vol. 5, p. 407, f. 12.—U. S. Dept. Agr., Inventory of Seeds, etc., no. 42, pl. 1.

Twigs stout (3–6 mm.), fluted, glabrous, light buff with very prominent lenticels. Buds brown, glabrate, round-ovoid, 3–4 mm. in diameter. Leaves deciduous, oblanceolate, acute, acute or rounded at base, coarsely serrate with stoutly mucronate teeth, slightly revolute, large (6–9×15–25 cm.), glossy above, glabrous; veins about 12–15×2, scarcely looped; petiole glabrous, 2×10–15 mm. Catkins?. Fruit apparently annual; cup turbinately goblet-shaped, extremely large (50–60 mm. in diameter), yellowish-tomentose, with about 10 encircling ridges the upper of which bear small deltoid thin scale tips some 5 mm. apart; acorn elongated-ovoid with conical base, thick-walled, 40–50×50–60 mm., becoming glabrous except for the densely yellow-tomentose tip, the lower third covered by the cup.

Central American region.—A remarkable species, in cup characters recalling somewhat some forms of tropical Asia, but closely allied to the following.

Specimens examined.—Mexico. Finca Irlanda, Chiapas (*Purpus, 6998*, Aug., 1913, the type; *7000?*).

CORRUGATAE.—Large trees with moderate glabrous twigs, round-ovoid buds, deciduous stipules, rather large lanceolate or oblanceolate coarsely incurved-serrate petioled glabrescent raised-venulose leaves, and annual short-stalked large fruit with more or less thick-based pointed appressed tomentose scales.—Central American and Eastern Sierra Madre regions.

Petiole short (5 mm.); acorn elongated..... *Q. Reevesii.*
Petiole moderate (10 mm.).
Acorn rather depressed, corrugated.
Fruit large (cup 30–60 mm.).
Leaves not granular.
Round-based.....*Q. corrugata.*
Acute-based.....*v. ipalensis.*
Leaves granular above.....*v. granulifera.*
Fruit relatively small (cup 25 mm.).....*f. microcarpa.*
Acorn round-ovoid, smooth.....*Q. Galeottii.*
Petiole rather long (15–30 mm.).....*Q. Pilgeriana.*

Quercus Reevesii n. sp.

Plate 22.

Twigs moderate (2–4 mm.), somewhat fluted, glabrate, olivaceous with rather prominent pale lenticels. Buds apparently round-ovoid and of moderate size. Leaves deciduous, oblanceolate, acute or slightly acuminate, cuneately narrowed to the obliquely rounded base and entire in the lower third, coarsely mucronately serrate above, flat, rather large (3–5×10–18 cm.), glossy and glabrous; veins about 15–18×2, the lower looped, the upper running into the teeth, raised-reticulate; petiole loosely hairy, becoming glabrous, about 1×5 mm. Catkins?. Fruit annual, sessile; cup openly goblet-shaped, very large (40–50 mm. in diameter) and thick-walled, with keeled and basally thickened closely appressed pointed tomentose scales; acorn elongated ovoid, as much as 35×50 mm., the lower third included.

Central American region.—A large tree.

Specimens examined.—Guatemala. Mountains west of the volcano Santa Maria, some 20 miles from Retalhuleu (*E. Reeves*, Feb., 1918, the type).

Quercus corrugata Hooker.

Plates 23 and 24.

Quercus corrugata Hooker, Icones Plant, vol. 5, pl. 403–404, 1842.—Liebmann-Oersted, Chênes Amér. Trop., pl. 31.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 25.

Twigs moderate (2–4 mm.), somewhat fluted, glabrate, dull buff with rather prominent pale lenticels. Buds somewhat glossy brown, round-ovoid, 3×3–4 mm. Leaves deciduous?, subelliptical-lanceolate, acute or rather attenuate at apex, rather oblique and more or less rounded at base, subentire to mostly incurved-serrate, narrowly revolute, rather large (3–4 or 6×10–15 or 18 cm.), glossy and glabrous on both faces or slightly puberulent beneath; veins about 10–12×2, scarcely looped, the reticulation little elevated; petiole glabrate, 1×10–20 or 30 mm. Catkins?. Fruit annual, sessile; cup half-round, very large (30–50 or 60 mm. in diameter), with rather thick-based scarcely spreading pointed yellow-tomentose scales; acorn ovoid, typically corrugated, especially below, half-included.

Central American region.—A tree 25–35 m. high.

Specimens examined.—Guatemala. Cerro del Tamber (*Skinner, 5.* 1840, the type, with acute rather thin and short-petioled veiny leaves). Costa Rica. Boruca (*?Pittier, 1891*).

With the leaves acute at base and long-petioled, it becomes var. **ipalensis**: Costa Rica. Volcan de Ipala (*Pittier, 1869*). With the leaves rather thicker, rounder-based and longer-petioled than in the type, and low bullate-roughened above, it is var. **granulifera**: Guatemala. Without locality (*Skinner, 3; v. Warscewicz, 11*, the type, *38* in part); Finca Sepacuite (*Cook & Griggs 569, 571*).

I have not seen the type of *Q. corrugata microcarpa* Wenzig, Jahrb. K. Bot. Garten, Berlin, vol. 3, p. 192, 1884 (*Polakovsky*, 1875, from Montana de Dota), with cup only 25 mm. in diameter and acorn 18×25 mm.

Quercus Galeottii Martens.

Plates 25 and 26.

Quercus Galeottii Martens, Bull. Acad. Brux., vol. 10, part 1, p. 220, 1843.—Liebmann-Oersted, Chênes Amér. Trop., pl. K, 26.—Oersted, Bidrag Kundsk. Egefamil., pl. 7.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 26.

Twigs rather stout (4 mm.), somewhat fluted, evanescently velvety, dull gray-brown with conspicuous pale lenticels. Buds brown, glabrous, ovoid, 2–3×4 mm. Leaves evergreen?, oblanceolate, acute, rather obliquely cuneate, crenate-serrate except toward the base, minutely revolute, large (5–7×12–17 cm.), glossy green and glabrous on both faces; veins about 13×2, scarcely looped; petiole glabrate, 1×10–15 mm. Catkins?. Fruit annual, subsessile or on a stalk scarcely 10 mm. long; cup half-round, very large (35–40 mm. in diameter), with somewhat thickened and loose acute tomentulose scales; acorn ovoid, 30–40 mm. long, about one-third included.

Warmer zone of the Eastern Sierra Madre region of Mexico.—A tree 25–35 m. high, equaling in size *Q. insignis*.

Specimens examined.—Santiago de Huatusco, at 800–1,800 m. (*Galeotti, 126*, 1840, the type); Huatusco (*Purpus, 6402* in part); without locality (*Ghiesbreght, 12*, 1842); San Bartolomé (*Liebmann*, Oct., 1841; and *208, 210, 211, 3480*, Nov., 1841); Jico (*Nelson, 3*, 1893); Cordoba (*?Fink, 1*); Zacuapam (*Purpus, 6402* in part).

QUERCUS PILGERIANA von Seemen.

Plate 27.

Quercus Pilgeriana v. Seemen, Bull. Herb. Boissier, ser. 2, vol. 4, p. 655, 1904.

Twigs moderate (3 mm.), little fluted, from dingy-tomentose glabrescent, with gray or orange epidermis, after the fall of which the bark is rather light brown with evident pale lenticels. Buds brown, glabrescent, rounded, 2 mm. in diameter. Leaves deciduous?, lanceolate, rather acuminate, mostly obliquely rounded at base, entire or bluntly low-serrate, slightly crisped and revolute, moderate (3–4×9–10 cm.), glossy and glabrous on both faces, the lower paler; veins about 10–12×2, looped; petiole tomentose, 1×10–20 mm. Catkins?. Fruit apparently annual, solitary or paired on very tomentose stalks scarcely 5 mm. long; cup (immature) with thin appressed blunt canescent scales, the young acorn as yet included.

Central American region.

Specimens examined.—Costa Rica. Rio Ciruelas (*Pittier, 2197*, the type); Cuesta de Tarrazu (*Pittier, 7871* in part).

EXCELSAE.—Large trees with moderately stout glabrous twigs, round-ovoid buds, usually deciduous stipules, rather large oblanceolate coarsely and deeply serrate or dentate short-petioled glabrous green raised-venulose leaves, and, so far as known, annual nearly sessile large fruit with appressed tomentulose scales.—Eastern and Western Sierra Madre regions of Mexico.

Leaves moderately petioled (10 mm.).....*Q. pinalensis.*
Leaves cuneately subsessile.
  Bluntly few-toothed.....*Q. chinantlensis.*
  Very acutely toothed.....*Q. excelsa.*

Quercus pinalensis n. nom.

Plate 28.

Quercus cuneifolia Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 179.—Liebmann-Oersted, Chênes Amér. Trop., p. 25, but not pl. K.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 76.—Not *Q. cuneifolia* Rafinesque, Alsographia Americana, p. 27, 1838.

Twigs rather slender (2–3 mm.), fluted, glabrous, dull blackish red, with small pale lenticels. Buds?. Leaves deciduous?, broadly oblanceolate, acute or subacuminate, cuneate to somewhat rounded at base, very coarsely and bluntly serrate-lobed, minutely cartilaginous-revolute, large (6–10×15–25 cm.), slightly glossy green, glabrous; veins about 10–12×2, branching and looped; petiole glabrous, about 2×5 mm. Flowers and fruit?.

Western Sierra Madre region of Mexico.

Specimens examined.—Cerro de Pinal (*Seemann, 1456*, the type of *Q. cuneifolia* Liebmann, in the Hookerian herbarium at Kew).

QUERCUS CHINANTLENSIS Liebmann.

Plate 28.

Quercus chinantlensis Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854. p. 179.—Liebmann-Oersted, Chênes Amér. Trop., p. 24.

Q. cuneifolia in part A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 76, 1864.—Liebmann-Oersted, Chênes Amér. Trop., pl. K.

Twigs rather slender (2–3 mm.), somewhat fluted, dark red-purple, glabrous. Buds?. Leaves deciduous?, oblanceolate, somewhat acuminate, long-cuneate, bluntly serrate-repand

above, large (5–6×14 cm.), rather glossy, glabrous on both faces; veins about 10×2, submarginally looped; petiole glabrous, scarcely 2×2 mm. Flowers and fruit?.

Eastern Sierra Madre region of Mexico.

Specimens examined.—Lacoba, Chinantla (*Liebmann, 204, 3471*, the type); near Jalapa (*Schiede, 598; Pringle, 7807*).

QUERCUS EXCELSA Liebmann.

Plates 29 and 30.

Quercus excelsa Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 174.—Liebmann-Oersted, Chênes Amér. Trop., p. 23, pl. 30.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 76.

Twigs moderate (3 mm.), little fluted, glabrous, dull light gray with rather prominent lenticels of the same color. Buds glossy red-brown, ovoid, 2×2–4 mm., the upper with persistent stipules. Leaves deciduous, oblanceolate, acute or subacuminate, cuneate or, when less narrowed, obliquely somewhat rounded at base, nearly entire to typically coarsely rather incurved-serrate from below the middle with the teeth callous-tipped, somewhat crisped and revolute, large (5–11×15–25 cm.), glossy green and glabrous on both faces; veins mostly about 20×2, obscurely looped, the reticulation raised on both sides; petiole glabrous, 2×2–5 or exceptionally 10 mm. Catkins?. Fruit annual?, subsessile; cup shallow saucer-shaped, large (35 mm. in diameter), with somewhat thickened or broad-keeled small appressed blunt more or less persistently tomentulose scales; acorn elongated-ovoid, 40–50 mm. long, covered at the base only.

Eastern Sierra Madre region of Mexico.

Specimens examined.—Matlaluga (*Liebmann, 205, 3477*, Jan., 1843, the type): Cordoba (*Fink, 5*); Los Naranjos (*Purpus, 7385*).

LANCIFOLIAE.—Small or moderate-sized trees with slender glabrate twigs, rounded buds, deciduous stipules, rather small lanceolate mostly serrate subsessile glabrous raised-venulose green leaves, and annual short-stalked rather large fruit with appressed tomentose scales.—Eastern Sierra Madre region of Mexico.

Leaves lanceolate.
- Cup deep, with coarse thickened scales.
  - Leaves toothed ..... *Q. leiophylla.*
  - Leaves essentially entire ..... *f. subintegra.*
- Cup shallow, with fine thin scales.
  - Twigs glabrous ..... *Q. lancifolia.*
  - Twigs for a time hairy ..... *f. pilosiuscula.*

Leaves obovate-oblanceolate ..... *Q. toxicodendrifolia.*

QUERCUS LEIOPHYLLA A. de Candolle.

Plate 31.

Quercus leiophylla A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 71, 1864.—Liebmann-Oersted, Chênes Amér. Trop., pl. K, 32.—Oersted, Bidrag Kundsk. Egefamil., pl. 7.
Q. lancifolia monocarpa Wenzig, Jahrb. K. Bot. Gart. Berlin, vol. 3, p. 192. 1884.

Twigs rather slender (2–3 mm.), fluted, glabrous, from light brown becoming buff or ashen with small pale lenticels. Buds dull light brown, glabrous, rounded, scarcely 2 mm. in diameter. Leaves evergreen, lanceolate or oblanceolate, acute at both ends, entire or typically serrate above the middle, somewhat revolute, rather small (1.5–3×7–12 cm), glossy and glabrous; veins about 12×2, looped; petiole glabrous, 1×2–3 mm. Catkins?. Fruit annual, solitary or paired on a glabrous peduncle 2×10–15 mm.; cup somewhat turbinate, large (20–30 mm. in diameter), with rather thick appressed acute yellow- or gray-tomentose scales; acorn ovoid, 25–30 mm. long, about one-third included.

Eastern Sierra Madre region of Mexico.

Specimens examined.—San Bartolomé (*Liebmann, 3503*, the type, as also of *Q. lancifolia monocarpa*); Dos Puentes (*Liebmann, 3502*); Huitamala (*Liebmann, 78, 3504*); Pic d'Orizaba, at 3,000 m. (*Galeotti, 129*, essentially entire-leaved, f. **subinterga**).

QUERCUS LANCIFOLIA Chamisso and Schlechtendal.

Plate 32.

Quercus lancifolia Chamisso & Schlechtendal, Linnaea, vol. 5, p. 78, 1830.—Oersted, Bidrag Kundsk. Egefamil., pl. 7.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 78.

Twigs slender (about 2 mm.), fluted, glabrous, buff or gray with pale lenticels. Buds rather dull, glabrous, round-ovoid, 2×3 mm. Leaves lanceolate, acute at both ends, subentire to serrately toothed above, somewhat revolute especially in the sinuses, rather small (1.5–2 or 3×8–12 cm.), glabrous, glossy, and finely raised-venulose above, dull and slightly paler beneath; veins about 12×2, looped; petiole glabrous, 1×3 mm. Catkins: ♀, 10 mm. long, 2-flowered at end. Fruit annual, solitary or paired on a glabrous peduncle 2×15 mm., cup very shallow, moderate (15 mm. in diameter), with thin appressed blunt gray-tomentose scales; acorn elongated-ovoid, 20 mm. long, covered at base only.

Eastern Sierra Madre region of Mexico.—A tree 15–25 m. high.

Specimens examined.—Jalapa (*Schiede, 15, 22*, May and October, the types, in the Berlin herbarium; *Hahn, 294*); S. Cristobal, Orizaba (*Bourgeau, 301; Botteri, 942*).

With at first rather hairy shoots, it is f. *pilosiuscula* Wenzig, Jahrb. K. Bot. Gart. Berlin, vol. 3, p. 192, 1884: Chicouquiardo (*Schiede*, September, 1829).

Quercus toxicodendrifolia n. sp.

Plate 33.

Twigs rather slender (2–3 mm.), somewhat fluted, from stellate-silky glabrescent, dark red with inconspicuous brown or pale lenticels, becoming rather gray the second season. Buds glossy brown, glabrescent, rounded, 2 mm. in diameter. Leaves deciduous?, elliptical-obovate, rather acute, rounded at base, serrately few-toothed or almost lobed above, very slightly revolute, moderate (2–3.5 or 5×4–7 or even 13 cm.), dull, glabrous, or somewhat hairy on the midrib above; veins about 10×2, looped, the upper running to the short callous tips of the teeth, petiole glabrescent, winged, 1×3 mm. Flowers and fruit?.

Mexican table land.—A shade-stage of some other species?, but not placed.

Specimens examined.—Zacualtipan (*Berlandier, 429, 533*, May 21, 1827, the type).

BOQUERONAEAE.—Moderate-sized trees, with slender glabrate twigs, rounded buds, deciduous stipules, rather small lanceolate usually low-toothed short-stalked glabrous somewhat raised-venulose leaves, and annual short-stalked rather large fruit with tomentose appressed scales.—Central American region.

Leaves crenately low-serrate.....*Q. boqueronae.*

Quercus boqueronae n. sp.

Plate 33.

Twigs slender (2 mm.), fluted, glabrous, buff with more or less evident lenticels. Buds dull light brown, glabrous, rounded, scarcely 2 mm. in diameter. Leaves deciduous, lanceolate, rather acute at both ends, entire to crenately or serrately few-toothed, somewhat revolute, rather small (1.5–3×5–8 cm.), glabrous, glossy above, rather dull beneath; veins about 12×2, looped; petiole glabrous, about 1×5 mm. Catkins?. Fruit annual, solitary or paired on a glabrous peduncle 2×10–20 mm.; cup turbinately half-round, moderate (20 mm. in diameter), with rather thick and acute appressed yellow-tomentose scales; acorn oblong-ovoid, 25 mm. long, scarcely one-third included.

Central American region.

Specimens examined.—Mexico. Cerro del Boqueron, Chiapas (*Purpus, 6997*, Sept., 1913, the type).

GLABRESCENTES.—Small trees or shrubs with slender at first tomentose mostly glabrescent twigs, round-ovoid buds, deciduous stipules, moderately small lanceolate or oblanceolate incisely serrate (entire in a form of the first) short-petioled impressed-reticulate leaves puberulent or

loosely somewhat fleecy beneath or glabrate, and annual medium-sized short-stalked fruit with acute usually little-thickened tomentose scales.—Mexican table land and cordilleran regions.

Leaves oblong-lanceolate, glabrescent.
Coarsely toothed.....*Q. glabrescens.*
Entire or merely repand.....*f. integrifolia.*
Leaves oblanceolate, puberulent beneath.....*Q. Radlkoferiana.*

QUERCUS GLABRESCENS Bentham.

Plate 34.

Quercus glabrescens Bentham, Plant. Hartweg., p. 56, 348, 1840.—Liebmann-Oersted, Chênes Amér. Trop., pl. K, 39.—v. Ettingshausen & Krašan, Denkschr. Akad. Wien, vol. 56, part 1, pl. 10.—A de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 35.

Twigs rather slender (2–3 mm.), more or less fluted, stellate-villous or glabrate, brownish with pale lenticels. Buds brown, glabrous, ovoid, 2×3 mm. Leaves deciduous, elliptical-oblong or lanceolate, acute, mostly rounded at base or subcordate, coarsely serrate above and revolute especially in the sinuses, rather small (2.5–3×6–10 cm.), glossy above and glabrate or the midrib puberulent, duller and often stellate-pubescent beneath; veins about 10×2, at most obscurely looped; petiole stellate-tomentose, 1×5–8 mm. Catkins: ♂ (young) scarcely 20 mm. long, yellow-villous, as yet with indehiscent glabrous anthers. Fruit annual, mostly 2 or 3 at end of a somewhat tomentose stalk 5–10 mm. long, but occasionally distributed along a peduncle of twice this length; cup saucer-shaped, moderate (15 mm. in diameter), with somewhat thickened and lax acute red or mostly hoary scales; acorn elongated, less than one-third concealed.

Mexican table-land.—A small tree, scarcely 3 m. high.

Specimens examined.—Real del Monte (*Hartweg, 428*, the type, which occurs in the Delessert herbarium as *no. 426; Ehrenberg, D, E, F, 263*); Pico de Orizaba at 2,500 m. (*Liebmann, 160, 3487, 162*, July, 1841); Cerro Leon (*Liebmann, 161, 3486*, July, 1841); Boca del Monte (*Schenck, 94*); without locality (*Galeotti, 130*, 1840, with leaves 5×12 cm., equally glossy on both faces; *Deppe, A. B.*). Cultivated at Copenhagen; and in the Dublin Botanical Garden (*?Henry, 2*, approaching the next).

With entire leaves and either normal or reduced fruit, it becomes f. *integrifolia* Liebmann in de Candolle, Prodromus, vol. 16, part 2, p. 35, 1864; Pico de Orizaba (*Liebmann, 165–7, 3488*, Sept., 1841, the type; *164, 3487* in part, a transition to the normal toothed form).

Quercus Radlkoferiana, n. sp.

Plate 35.

Twigs slender (2 mm.), more or less fluted, from stellate-villous glabrescent, brown with similarly colored lenticels. Buds brown, glabrescent, round-ovoid, 2 mm. in diameter. Leaves deciduous?, elliptical-obovate, acute, rounded at base, nearly entire to typically sharply and deeply serrate, revolute, rather small (1.5–4×5–8 cm.), glossy and glabrous or with puberulent midrib above, duller and rusty-stellate beneath; veins about 10×2, branched and incompletely looped; petiole tomentose, 1×5 mm. Catkins?. Fruit annual, nearly sessile; cup turbinate, rather small (about 12 mm. in diameter), with thin rather loose acute red or golden-puberulent scales; acorn ovoid, half-included.

Cordilleran region of Mexico.

Specimens examined.—Chinantla (*Liebmann, 156, 3483*, the type); Cuesta de Lachopa (*Liebmann, 157, 3484*, with leaves 4×11 cm.); Cerro de Semoaltepec (*?Liebmann, 158, 3485*); Cerro de S. Felipe (*Pringle, 6277; ?Conzatti, 2216*); Istaccihuatl, at 3,000 m. (*Purpus, 1798*); Salto de Agua (*Purpus, 1796*).

POLYMORPHAE.—Large trees with moderately stout glabrate twigs, ovoid buds, deciduous stipules, moderately large ovate-lanceolate or oblong entire or few-toothed petioled glabrous

pinnately impressed leaves glaucescent beneath, and annual more or less slender-stalked medium sized fruit with thickened tomentose scales.—Eastern Sierra Madre region of Mexico.

Leaves rather long-petioled (10–20 mm.).....*Q. polymorpha.*
Leaves short-petioled (scarcely 5 mm.).
Elliptical-oblong, cuneate.....*Q. Juergensenii.*
Ovate-elliptical, not cuneate.....*Q. porphyrogenita.*

QUERCUS POLYMORPHA Chamisso and Schlechtendal.

Plates 36 to 38.

Quercus polymorpha Chamisso & Schlechtendal, Linnaea, vol. 5, p. 78, 1830.—Liebmann-Oersted, Chênes Amér. Trop., p. 6, f. 1, pl. 38.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 28.
Q. petiolaris Bentham, Plant. Hartweg., p. 55, 348, 1840.—v. Ettingshausen, Denkschr. K. Akad. Wien, vol. 15, part 1, pl. 10.
Q. varians Martens & Galeotti Bull. Acad. Brux., vol. 10, part 1, p. 214. 1843.

Twigs rather slender (2-3 mm.), somewhat fluted, glabrous, reddish or quickly gray with rather prominent small lenticels. Buds brown, rather persistently hairy, ovoid, becoming 4×6 mm. Leaves partly evergreen, lance-ovate or ovate, usually obtuse or slightly emarginate, mostly rounded at base or shallow-cordate, entire or with a few shallow teeth at the end, minutely revolute, rather large (2.5–6×6–13 cm.), glabrous and glossy above, dull, lightly glaucous and sometimes somewhat rusty-floccose beneath, especially in sheltered places; veins about 12–15×2, looped, prominently reticulated below; petiole glabrous, from 6 to typically 15–25 mm. long. Catkins: ♂, 80 mm. long, floccose, rather densely flowered, the small glabrous anthers long-exserted; ♀, usually short and 1- or 2-flowered. Fruit annual, the peduncle 2×4–30 mm.; cup half-round, moderate (15 mm. in diameter), with thickened appressed acute canescent scales; acorn elongated, typically more than half-included, hairy.

Eastern Sierra Madre region of Mexico, reappearing in Central America; of unusually wide distribution. A tree 12–20 m. high.

Specimens examined.—Mexico. Hacienda de la Laguna, near Jalapa (*Scheide, 20, 501b,* July and Oct., 1828, the types; also various specimens without number in the Berlin herbarium); Zacualtipan (*Berlandier, B*); Mirador (*Sartorius; Ghiesbreght, 8,* 1842; *Liebmann, 3540, 3542; Ross, 583, 595,* with broadly ovate cordate short-acuminate leaves 9×15 cm., on petioles 10 mm. long); Jalapa (*Galeotti, 93,* 1840); Zacuapam (*Galeotti, 92,* 1840, at 900 m., the type of *Q. varians; Purpus, 2093, 6167*); Chiltopec (*Galeotti, 15*); Bolaños (*Hartweg, 420,* the type of *Q. petiolaris*); near Jacala (*Ehrenberg, 972*); near Zimapan (*Ehrenberg, 1089*); San José Pass, S. L. P. (*Pringle, 3325,* with rather narrower leaves); Pelote, S. L. P. (*Purpus, 4940*); Trinidad (*Herb. Hooker*); Vera Cruz to Orizaba (*Mueller, 1597, 1747*); Orizaba (*Botteri, 887, Mohr*); without data (*Karwinski,* 1844; "*Herbar. Biener,*" in the Vienna herbarium); mountains near Monterrey (*Sargent,* 1887, 1900; *Canby, Sargent & Trelease, 229, 230; Pringle 2102, 10200,* with leaf-base usually acute); cultivated at the Villa Thuret, Antibes (*Berger, 1, 2,* 1912). GUATEMALA. Uaxac Canal (*Seler, 3067,* said to be the chief component of the forest).

QUERCUS JUERGENSENII Liebmann.

Plate 38.

Quercus Juergensenii Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 188.—Liebmann-Oersted, Chênes Amér. Trop., p. 27.
Q. Jurgensenii A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 78, 1864.
Q. Juergensii Liebmann-Oersted, Chênes Amér. Trop., pl. 33, 1869.

"Foliis coriaceis brevipetiolatis ovato-lanceolatis obtusiusculis basi cuneatis margine parum reflexo repandis, supra nitidis glabris, subtus pallidioribus ad costam et axillas nervorum parce barbatis mox glabrescentibus, petiolis compressis glabris; fructibus geminis solitariisve pedunculatis, pedunculo glabrescente, cupula craterimorpha, glande ovoideo-conica. Folia 3–4″ longa, 1½″ lata, petioli 3‴, pedunculi 4–6‴, cupula 5–6‴ alta 6–7‴ in diametro.

"Mexico, Chinantla, Dp. Puebla, *Liebm.* Species affinis *Q. lanceolatae* HB."

A questionable species of the Cordillera, perhaps destined always to remain problematic, since it appears to be represented in the Copenhagen herbarium only by a few fruits which are more closely comparable with those of *Q. polymorpha* than those of any other known species, while the foliage, apparently not seen since Liebmann's description was drawn, though not inconsistent with some leaves of *polymorpha*, is very suggestive of some of the black oaks, not only of the *lanceolata* set, with which Liebmann compares it, but of the *oajacana* group except for the cuneate base.

Quercus porphyrogenita n. sp.

Plate 39.

Twigs rather slender (2–3 mm.), somewhat fluted, rather dull brown, glabrate and for a time somewhat pruinose. Buds brown, glabrescent, ovoid, scarcely 2×3 mm. Leaves barely evergreen, elliptical-oblong, undulate and scarcely 2.5×6 cm. to elliptical-obovate, crenately or coarsely serrately toothed above and 3.5–4.5×7–10 cm., obtuse, rounded at base, minutely cartilaginous-revolute, glabrous, rather blue-green, slightly glossy above or entirely dull; veins about 10–12×2, rather brokenly looped; petiole puberulent or glabrescent, pruinose, 3–5 mm. long. Catkins: ♂, 40 mm. long, woolly, at length rather openly flowered, the small rounded hairy anthers little exserted. Fruit?

Eastern Sierra Madre region of Mexico.—A small tree scarcely 10 m. high, coloring the mountains with red-purple when its foliage is expanding.

Specimens examined.—Mountains near Monterrey, N. L. (*Trelease, 117*, the type, in the herbarium of the Missouri Botanical Garden; *120, 118?*, Mar. 19, 1900: *Canby, Sargent & Trelease, 225; Sargent*, Mar. 19, 1900; *Pringle, 2884*). Perhaps also to be referred here a fragment from "Walnut Grove," near Monterrey (*Gregg, 223*, not at all pruinose, with pointed buds as much as 3×7 mm., and, in one case, elliptical leaves crenately few-lobed above and measuring 10×17 cm.).

GERMANAE.—Large trees with moderately stout glabrate twigs, round-ovoid buds, deciduous stipules, moderately large elliptical-oblong bluntly few-toothed short-petioled glabrous raised-venulose leaves glaucescent beneath, and annual very thick-stalked moderately large fruit with typically thickened tomentose scales.—Eastern Sierra Madre region of Mexico.

Scales appressed, thickened at base.
- Petiole short ..... *Q. germana.*
- Petiole elongated ..... v. *Lemmoni.*

Scales lax, scarcely thickened ..... f. *echinata.*

QUERCUS GERMANA Chamisso and Schlechtendal.

Plate 40.

Quercus germana Chamisso & Schlechtendal, Linnaea, vol. 5, p. 78, 1830.—Liebmann-Oersted, Chênes Amér. Trop., p. 6, f. 1, pl. H, 37.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 77.

Twigs moderate (3 mm.), fluted, glabrous, from brown or somewhat buff becoming gray, with small but prominent lenticels. Buds rather light brown, round-ovoid, 2×3 mm. Leaves deciduous?, elliptical or obovate-oblong, rather bluntly acute, rounded at base, coarsely crenately few-toothed near the end, moderate (3–5×9–12 cm.), glabrous, rather glossy above, the lower surface dull and, when dry, pinkish glaucescent; veins about 12×2, somewhat forking and looped, the upper passing into the short callous tips of the teeth; petiole glabrous, 2×5 mm. Catkins?. Fruit annual, about 2 at end of a stout peduncle 3–4×15–50 mm.; cup subglobose, large (25 mm. in diameter), with thickened appressed acute rusty- or gray-tomentose scales blackening when abraded; acorn subglobose, rusty-tomentose, almost entirely included.

Eastern Sierra Madre region of Mexico.

Specimens examined.—Jalapa (*Scheide, 21, 596*, August, 1828, the type; *Hahn, 278*); Cofre de Perote (*Hahn*, July 1866); Tamosopo Cañon, San (Louis Potosi (*Pringle, 3494*).

A form with petioles 10–20 mm. long, some leaves ovate and 6×12 cm., and fringed cups with the lower scales less thickened, is var. **Lemmoni:** Orizaba (*Mr. & Mrs. J. G. Lemmon, 103*, in the U. S. National Herbarium).

With persistently thin, squarrose cup-scales, it may be designated as f. **echinata**—Jalapa (*Hahn, 344*).

STENOBALANEAE.—Rather large trees with moderately stout glabrous twigs, ovoid buds with some persistent stipules, large elliptical entire very short-petioled glabrous glaucescent thin low-reticulate leaves, and annual? moderately large thick-stalked fruit with somewhat thickened tomentose scales.—Eastern Sierra Madre region of Mexico.

Acorns elongated, long-exserted.....Q. substenocarpa

Quercus substenocarpa n. sp.

Plate 41.

Quercus stenobalanus v. Seemen in herb., not *Q. stenobalanos* Gandoger, Flore Lyonnaise, p. 202, 1875.

Twigs rather stout (4 mm.), fluted, glabrous and glossy, somewhat buff with prominent small lenticels. Buds dull dark brown, puberulent, ovoid, 3×4 mm. with persistent dark stipules. Leaves deciduous?, obovate-oblong, obtusely very short-acuminate and mucronate, narrowed-cordate, from entire to crenately toothed above, large (6–7×14–16 cm.), glabrous, slightly glossy above, dull and lightly glaucous beneath: veins about 12–15×2, forked and looping toward the margin; petiole glabrous, 3×5 mm. Catkins?. Fruit annual?, mostly solitary at end of a glabrous gray peduncle 2–4×20–30 mm.; cup deep, large (25–30 mm. in diameter), with thick-based appressed acuminate densely tomentulose scales: acorn barrel-shaped, elongated, 40 mm. long, less than half included.

Eastern Sierra Madre region of Mexico.

Specimens examined.—Hacienda de Tamosopo (*Pringle, 3969*, December 2, 1891, the type).

GLAUCOIDEAE.—Rather small trees with mostly slender glabrous twigs, round-ovoid buds, deciduous stipules, mostly medium-sized elliptical or oblong entire or crenate short-petioled obtuse often cordate glabrate and often glaucous leaves more or less raised-venulose above and with prominent secondary veins beneath, and annual mostly conspicuously peduncled and often clustered moderate fruit with somewhat thickened tomentose scales.—Cordilleran and adjacent Sierra Madre regions of Mexico.

Petiole short (scarcely 5 mm.).
  Cup scales short; leaves scarcely revolute.
    Leaves elliptical.
      Rather glossy above, moderately stalked.....*Q. glaucoides.*
      Dull on both faces, subsessile.....*Q. baldoquinae.*
    Leaves obovate-elliptical, dull.
      Crenate above.
        Flat.....*Q. glaucophylla.*
        Crisped.....f. *tlacolulana.*
      Coarsely subdentate or subserrate.....*Q. mixtecana.*
  Inner cup-scales acutely elongated; leaves revolute.....*Q. sororia.*
Petiole longer (10 mm.); leaves somewhat revolute.....*Q. Harmsiana.*

QUERCUS GLAUCOIDES Martens and Galeotti.

Plates 42 and 43.

Quercus glaucoides Martens & Galeotti, Bull. Acad. Brux., vol. 10, part 1, p. 209, 1843.—Liebmann-Oersted, Chênes Amér. Trop., pl. H, 34.—Oersted, Bidrag Kundsk. Egefamil., pl. 3.—A de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 31.

Q. cordata, Martens & Galeotti, *l. c.* p. 211, 1843.—A de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 76.

Twigs slender (2 mm.), fluted, soon glabrous, occasionally glaucescent, dull orange with small pale lenticels. Buds dull pale brown, for a time hairy, round-ovoid, scarcely 2 mm. in diameter. Leaves deciduous, elliptical to broadly oblong or occasionally widened upwards, very obtuse or slightly emarginate, shallowly cordate, entire or somewhat repand or low-crenate above, moderate (3–5×5–9 cm.), from long-tomentose quickly glabrate, glossy and somewhat

bluish green above, dull and lightly glaucous beneath; veins about 12×2, looped; petiole glabrescent, scarcely 1×5 mm. Catkins: ♂, 30 mm. long, caducously floccose, the rounded hairy anthers exserted; ♀, usually 10–30 mm. long, glabrescent, with 3 or 4 brown-lanose flowers. Fruit annual, solitary or several on a peduncle usually 10–50 mm. long; cup half-round, rather small (12 mm. in diameter), with keeled appressed acute scales from canescent becoming glabrate and orange or brown; acorn of the young fruit included.

Cordilleran region of Mexico.—A tree 10–17 m. high.

Specimens examined.—Oaxaca. Mixteca Alta, at 2,600 m. (*Galeotti, 103*, June, 1840, the type); Cerro de S. Felipe (*Liebmann, 103, 3475, 3489*); Lomas de S. Felipe, at 1,700 m. (*Conzatti, 1820, 1821*); Cerro de S. Antonio, at 1,700 m. (*Conzatti, 1414*); S. Juan del Estado (*C. L. Smith, 779*); Agua Escondida (*Seler, 1757*); Cuauhtlilla (*Seler, 1483*). Puebla. Sierra de Mixteca, near S. Luis (*Schenck, 237*); Cerro del Gavilan (*Purpus, 4090*); Cerro Tepoxuchil (*Nicolas, 1911; Arsène, 105*).

The type of *Q. cordata* (*Galeotti, 111*), here treated as synonymous with *glaucoides*, is not now to be found. The species is said to be a thick-trunked tree only 3–4 m. high, with short thickish gnarled branches and numerous branchlets in a round tufted head, characteristic of the cool-temperate region of the Mixteca Alta at 2,100–2,500 m. above sea-level, and the original diagnosis reads: "Glabra. Foliis subsessilibus integerrimis nitidis elliptico-cordatis, pedunculis brevibus, fructibus brevè spicatis, immaturis lanuginosis parvulis. Folia 2½ pollices longa, 1½ pollicem lata basi profunde cordata, fructus immaturi magnitudine pisi."

Quercus baldoquinae n. sp.

Plate 43.

Twigs rather slender (2–3 mm.), fluted, glabrous, slightly glaucous, buff with small prominent lenticels. Buds dull brown, glabrate, rounded, about 2 mm. in diameter. Leaves deciduous?, elliptical-obovate or broadly oblong, very obtuse, shallowly cordate, low-undulate or repand-crenate, moderate (3–5×7–12, or exceptionally 11×18 cm.), dull blue-green rather than glaucous, glabrous; veins about 8–10×2, obscurely looped, finely raised on both faces; petiole glabrous, or stellate-fleecy above, scarcely 3 mm. long. Catkins?. Fruit annual, sessile or several along or at the end of a glabrate peduncle as much as 50 mm. long; cup half-round, moderate (12–15 mm. in diameter), with slightly thickened appressed acute hoary or red-tipped scales; acorn ovoid, 15 mm. long, half-immersed.

Western Sierra Madre region of Mexico.—A tree 8–10 m. high, yielding good timber, called encino tocuz.

Specimens examined.—Cerro Baldoquin, Michoacan (*Endlich, 1354*, the type).

QUERCUS GLAUCOPHYLLA v. Seemen.

Plates 44 and 45.

Quercus glaucophylla v. Seemen, Bot. Jahrb., vol. 29, p. 95, 1900.

Twigs rather slender (2–3 mm.), somewhat fluted, glabrous, slightly glaucous, red becoming buff or finally gray with prominent lenticels. Buds brown, glabrate, subglobose, 2 mm. in diameter. Leaves deciduous, hard-papery, obovate-elliptical, very obtuse, shallowly cordate, flat, entire or undulate to crenate-serrate or crenate above, moderate (2–5×4–10 or even 11×17 cm.), dull blue-green, glabrous, slightly paler or glaucescent beneath; veins about 10×2, raised on both faces, looped; petiole glabrous and glaucous, scarcely 3 mm. long. Catkins?. Fruit annual, from solitary and sessile or paired on short stalks to somewhat verticillate on glabrous peduncles 2×60 mm.; cup half-round, moderate (10–15 mm. in diameter), with thickened appressed acute ashen or red-tipped scales; acorn ovoid, 12–15 mm. long, half-included.

Cordilleran region of Mexico.—A tree 3–10 m. high.

Specimens examined.—Sierra de S. Felipe, Oax. (*Pringle, 4843*, 1894, the type).

With rounder leaves 4–5×6–8 cm., greener beneath and crisply somewhat deeply crenate, it becomes *f.* **tlacolulana:** Totolapam, Tlacolula, Oax. (*Seler, 1752*); S. Miguel Alborrados, Oax. (*Nelson, 532*); Las Sedas, Oax. (*Conzatti, 1808*).

Quercus Harmsiana n. sp.

Plate 45.

Twigs slender (2 mm.), fluted, glabrous and apparently transiently glaucous, rather dull, brownish with small pale lenticels. Buds dull brown, glabrous, round-ovoid, 2 mm. in diameter. Leaves deciduous?, elliptical or slightly widened upwards, very obtuse or bluntly a little acuminate, slightly cordate, entire, narrowly revolute, moderate (3–4×8–9 cm.), glossy above, dull and lightly glaucous beneath with the midrib slightly fleecy; veins some 10–15×2, looped; petiole fleecy or glabrescent, 1×10 mm. Catkins?. Fruit annual, solitary or paired, the peduncle scarcely 10 mm. long; cup (immature) with somewhat ribbed appressed rather blunt tomentose scales.

Western Sierra Madre region of Mexico.—A tree 10–15 m. high, yielding good wood. Called encino.

Specimens examined.—Cerro Baldoquin, Ario de Rosales, Michoacan, at 1,800–2,000 m. (*Endlich, 1356*, August 1, 1906, the type).

CANCELLATAE.—Small trees with slender glabrate twigs, small globose buds, deciduous stipules, moderate elliptical rather acute entire or crenately few-toothed short-petioled puberulent or glabrescent leaves with veins prominent above, and annual moderately small fruit with little-thickened tomentose scales.—Mexican table-land and adjacent cordilleran region.

Leaves mostly with a few repand teeth, glabrous ..... *Q. conjungens.*
Leaves undulate or almost entire, somewhat puberulent beneath or on both faces ..... *Q. cancellata.*

Quercus mixtecana n. sp.

Plate 46.

Twigs moderate (2–4 mm.), little fluted, glabrous, rather dull, greenish with rather prominent small lenticels. Buds dull brown, glabrous, round, about 3 mm. in diameter. Leaves deciduous, obovate, obtuse, shallowly cordate, crisply somewhat serrately incised above, rather large (6×10–12 cm.), glabrous and very lightly glaucous, dull light blue-green above, clear green with prominent white venation beneath; veins about 7–9×2, looped; petiole glabrous, about 2×3 mm. Catkins?. Fruit annual, usually about 5 clustered toward the end of a tomentose or glabrescent peduncle about 2×50–60 mm.; cup half-round, rather small (about 12 mm. in diameter), with thickened appressed acute grayish or brown scales black when rubbed; acorn short-ovoid, scarcely 10 mm. long, rusty-silky above, more than half-included.

Cordilleran region of Mexico.—A tree.

Specimens examined.—Sierra de Mixteca, S. Luis, Puebla (*Schenck, 235*, August 16, 1908, the type); Cerro de Antonio, Oaxaca (*Conzatti, 1416*).

QUERCUS SORORIA Liebmann.

Plate 47.

Quercus sororia Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 175.—Liebmann-Oersted, Chênes Amér. Trop., p. 23, pl. 6.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 80.
Q. glauca Oersted in Liebmann-Oersted, Chênes Amér. Trop., p. 16, 29, and corrigenda, pl. 36.—Name only.

Twigs moderate (3–4 mm.), little fluted, from floccose glabrescent, rather dull, grayish buff. Buds brown, glabrous, ovoid, acute, 3×4 mm. Leaves elliptical or slightly widened upward, obtuse, sometimes mucronate, subcordate, entire, slightly revolute, moderate (3–5×9–13 cm.), glossy and glabrous above, dull, slightly glaucous and exceptionally fleecy in sheltered places beneath; veins about 10–15×2, looped; petiole glabrous, 2×3–5 mm. Catkins?. Fruit annual, solitary or paired, sessile or on a slightly canescent peduncle scarcely 10 mm. long; cup deeply saucer-shaped, rather large (20 mm. in diameter), with little-thickened rather loose acute brown scales; acorn ovoid, 20 mm. long, about one-third included.

Cordilleran region of Mexico.

Specimens examined.—Oaxaca. [Chinantla] (*Liebmann, 3562*, at once the type of *Q. sororia* and *Q. glauca*); Mt. Capulalpan (*Galeotti, 7b*); Tonaguia (*Galeotti, 8*); Monte de Llano Verde (*Galeotti, 8*).

Quercus conjungen n. sp.

Plate 48.

Twigs moderate (3 mm.), somewhat fluted, glabrous, buff with rather crowded and prominent small lenticels. Buds rather glossy brown, glabrous, subglobose, 1 mm. in diameter. Leaves deciduous?, elliptical, very obtuse, obliquely rounded at base or mostly cordate, entire to inequilaterally 1- or 3- or 5-shouldered above, finely crisped, moderate (3.5–5×8–11 cm.), dull, blue-green above, scarcely glaucous beneath, glabrous; veins about 10–12×2, looped; petiole glabrous, 1.5×5–8 mm. Catkins?. Fruit annual, sessile, paired; cup hemispherical, moderate (12–15 mm. in diameter), with thin appressed acute red-brown scales brownish- or grayish-tomentose below; acorn ovoid, glaucous, 15 mm. long, about half-included.

Mexican table-land.—A dwarf species, scarcely 3 m. high.

Specimens examined.—Acambaro, Guanajuato, at 1,900 m. (*Pringle, 8841*, Oct. 6, 1904, the type); Tula, Hidalgo (*Pringle, 7879*).

Quercus cancellata n. sp.

Plate 49.

Twigs rather slender (2–3 mm.), little fluted, soon glabrous and somewhat glossy, from greenish becoming gray with rather prominent small lenticels. Buds dull brown, glabrescent, rounded and 2 mm. in diameter or at the end bluntly ovoid and 3×5 mm. Leaves deciduous?, subelliptical, obtuse or emarginate or mucronate, rounded at base, crisped and somewhat shallow-toothed above, rather small (2.5–3.5×5–7 cm.), slightly glossy green, minutely cancellate-venulose and sparingly stellate-tufted above, dull, openly stellate, and coarsely veiny beneath; veins about 7–10×2, rather forking, looped; petiole loosely stellate-villous, 1×5 mm. Catkins?. Fruit annual, 1–3 at end of a scurfy reddish peduncle 1.5×15–30 mm.; cup (immature) round, 8 mm. in diameter, with thin appressed blunt scales brown where abraded; acorn as yet round, silky, included.

Cordilleran region of Mexico.

Specimens examined.—Puebla. Sierra de Mixteca (*Schenck, 236*, Aug. 24, 1908, the type, in the Berlin herbarium); Esperanza (*Schenck, 92*).

GLAUCESCENTES.—Large trees with rather slender glabrous twigs, ovoid buds, persistent stipules, rather large oblanceolate somewhat undulate leaves raised-venulose above and very minutely hoary beneath, and annual long-stalked fruit.—Western Sierra Madre region of Mexico.

Leaves cuneate, more or less toothed upwards.....*Q. glaucescens.*

QUERCUS GLAUCESCENS Humboldt and Bonpland.

Plate 50.

Quercus glaucescens Humboldt & Bonpland, Plant. Aequinoct., vol. 2, p. 29, pl. 78, 1809.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 77.

Twigs moderate (3 mm.), somewhat fluted, glabrous, reddish brown with small pale lenticels becoming prominent the second season. Buds dark brown, for a time hairy, round-ovoid, 2×3 mm., the upper with persistent stipules. Leaves deciduous, oblanceolate, rather obtuse to subacuminate, cuneate, repand or somewhat coarsely serrate above with very blunt teeth, large (5 or 6–8×12–15 or 16 cm.), glabrous, slightly glossy and finely raised-venulose above, minutely but densely pale- or dingy-tomentulose beneath; veins about 10×2, red below, looped; petiole glabrous, 2×5–10 mm. Catkins: ♂, 50–60 mm. long, glabrescent, rather closely flowered, the rounded glabrous anthers exserted; ♀, equally long, verticillately several-flowered. Fruit?.

Western Sierra Madre region of Mexico.—A large tree.

Specimens examined.—Caieguale, near la Moxonera, between Acapulco and Chilpancingo (*Bonpland, 3921*, the type); without locality (*Haenke, 373*, in the herbarium of the National Museum at Prag); Colomas, Sinaloa, in the foothills (*Rose, 1757*).

TUBERCULATAE.—Moderate-sized trees with slender glabrate twigs, round-ovoid buds sometimes with persistent stipules, moderately large elliptical to obovate usually crenate and short-petioled glabrous or slightly scurfy or velvety leaves finely raised-venulose on both faces, and annual moderate usually short-stalked fruit with somewhat keeled puberulent scales.—Western Sierra Madre region of Mexico, and in Baja California.

Leaves mostly elliptical or oblanceolate: petioles short (5 mm.).
Cups widened below; leaves glabrous. Continental.....*Q. tuberculata.*
Cups broadest at top; leaves puberulent. Peninsular.....*Q. idonea.*
Leaves characteristically obovate.
Petioles and peduncles short (scarcely 5 mm.).....*Q. subspathulata.*
Petioles and peduncles elongated (the latter 50 mm.).....*Q. crenatifolia.*

QUERCUS TUBERCULATA Liebmann.

Plate 51.

Quercus tuberculata Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 181.—Liebmann-Oersted, Chênes Amér. Trop., p. 25.
Q. polymorpha in part, A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 28, 1864.

Glabrate. Twigs rather slender (2–3 mm.), scarcely fluted, brown, with prominent pale lenticels. Buds dull brown, glabrous, ovoid, 2 mm. in diameter. Leaves deciduous, elliptical-oblanceolate, rather obtuse, rounded or acute at base, crenate, moderate (3–5×8–10 cm.), glabrescent or slightly scurfy below or on both faces; veins about 10–12×2, looped; petiole scarcely 5 mm. long. Catkins?. Fruit annual, solitary or paired, subsessile or on a peduncle scarcely 20 mm. long; cup saucer-shaped, moderate (15 mm. in diameter), contracted above, with keeled acute appressed canescent scales; acorn ovoid, 15 mm. long, scarcely one-third included.

Western Sierra Madre region of Mexico.

Specimens examined.—Without precise locality (*Seemann, 1970, 2970,* the types in the Kew herbarium).

QUERCUS IDONEA Goldman.

Plate 51.

Quercus idonea Goldman, Contr. U. S. Nat. Herb., vol. 16, p. 321, 1916.

Glabrescent throughout or rather persistently short-tomentose. Twigs moderate (3 mm.), scarcely fluted, brown with small prominent somewhat paler lenticels. Buds somewhat glossy brown, glabrous, round-ovoid, about 2 mm. in diameter. Leaves deciduous, elliptical to ovate or oblong, rather acute, acute to truncate or somewhat cordate at base, entire or crisply subserrately lobed above, minutely cartilaginous-revolute, moderate (4–6×10–12 cm.), glossy, the slightly paler lower surface prominently raised-reticulate; veins about 10–12×2, more or less branching, looped; petiole somewhat gray-scurfy or glabrate, red, 1.5×5 mm. Catkins?. Fruit annual, solitary or paired, subsessile; cup deep-saucer or cup-shaped, moderate (15 mm. in diameter), with rather close acute somewhat keeled dingy-puberulent scales; acorn elongated-ovoid or oblong, 20–25 mm. long, covered at base only.

Desert region of Mexico.—A tree 8–10 m. high.

Specimens examined.—Lower California. Sierra de la Laguna (*Nelson & Goldman, 7421, 7423*—the type, *7452*—all collected in January, 1906; *Brandegee,* Jan. 25, 1889, Jan. 26, 1890); La Mesa (*Brandegee,* Oct. 25, 1893); La Chuparosa (*?Brandegee,* Oct. 18, 1893); Triunfo (*Frazer,* July, 1887); Laguna (*Belding, ?*); Miraflores (*Belding, 9*); without locality (*Diguet*).

Quercus subspathulata n. sp.

Plate 52.

Glabrous. Twigs slender (2 mm.), somewhat fluted, dull purplish with small pale lenticels. Buds dull brown, glabrous, rounded, scarcely 2 mm. in diameter, the upper with more or less persistent setaceous stipules. Leaves deciduous, obovate-subspatulate, very obtuse to blunt-pointed, rounded at base or very shallowly cordate, slightly undulate or very low repand-

toothed, minutely cartilaginous-revolute, moderate (3.5–5×8–11 cm.), very slightly glossy above, dull and drying brownish beneath; veins about 15×2, somewhat indistinctly looped, slightly glaucous like the midrib; peticle red, scarcely 5 mm. long; Catkins?. Fruit solitary and subsessile or 2 or 3 on a peduncle scarcely 15 mm. long; cup half-round, rather small (12 mm. in diameter), with slightly thickened acute appressed puberulent scales; acorn elongated, 10×25 mm., about one-fourth included.

Western Sierra Madre region of Mexico.

Specimens examined.—Without precise locality, State of Durango (*Rose, 2239*, August 13, 1897, the type in the U. S. National herbarium, as sheet no. *301153*).

Quercus crenatifolia n. sp.

Plate 52.

Twigs slender (2 mm.), fluted, sparsely scurfy or glabrate, reddish with small brown lenticels. Buds light brown, glabrescent, round-ovoid, 2 mm. in diameter. Leaves deciduous, obovate-panduriform, obtuse, rounded at base or slightly cordate, rather deeply crenate, often crisped in the sinuses, moderate (4–6×7–9 cm.), somewhat glossy and sparsely finely scurfy or glabrate above, paler beneath and glabrescent except for stellate-pubescence in sheltered places, veins about 8×2, more or less branched but at most obscurely looped; petiole somewhat yellow-stellate, 1×5–10 mm. Catkins: ♀, filiform, 50 mm. long, sparingly stellate, openly few-flowered above, the young scales blunt and thinly and minutely puberulent. Fruit?.

Western Sierra Madre region of Mexico.

Specimens examined.—Chiquilistlan, Jalisco (*Jones, 440*, May, 1892, the type).

AURANTIACAE.—Moderate-sized trees with slender glabrous often orange-colored twigs, round-ovoid buds, mostly deciduous stipules, moderately large elliptical-obovate crenate short-petioled glabrous leaves finely raised-venulose above and rather coarsely veined beneath, and annual moderate subsessile fruit with somewhat thickened puberulent scales. Western Sierra Madre region of Mexico.

Leaves acute at base.....*Q. aurantiaca.*
Leaves obtuse at base.....*Q. Standleyi.*

Quercus aurantiaca n. sp.

Plate 53.

Glabrous. Twigs moderate (3 mm.), scarcely fluted, orange with prominent small lenticels, becoming gray in the second or third year. Buds rather dull brown, glabrous, round-ovoid, 2–3×4–5 mm. Leaves deciduous?, elliptical-obovate, mostly very obtuse, rather acute at base, shallowly crenately toothed, minutely cartilaginous-revolute, moderate (4–5×10–14 cm.), glossy above, paler and duller beneath; veins about 10–12×2, looped; petiole brown, 5 to mostly 10 mm. long. Catkins?. Fruit annual, usually subsessile, solitary or paired; cup saucer-shaped, rather large (15–20 mm. in diameter), with rather tuberculate-keeled acute appressed puberulent scales; acorn ovoid, about 18 mm. long, less than half-included.

Western Sierra Madre region of Mexico.—A tree 6–8 m. high, yielding good timber, called encino.

Specimens examined.—Agua Caliente de Huachara to Basagote, Chihuahua (*Endlich, 770*, Dec. 27, 1904, the type, in the Berlin herbarium).

QUERCUS STANDLEYI Trelease.

Quercus Standleyi Trelease in Standley, Contr. U. S. Nat. Herb., vol. 23, p. 181, 1922.

Plate 53.

Glabrous and glossy. Twigs rather slender (2–3 mm.), little fluted, orange-brown with minute pale lenticels. Buds brown with tomentulose-ciliate scales, subglobose, 2 mm. in diameter. Leaves deciduous?, elliptical-obovate, very obtuse, the somewhat contracted base

rather rounded, coarsely crenate, rather large (6–10×13 or 12×15–24 cm.), paler beneath; veins rosy at base, about 12×2, branched and somewhat looped, whitened beneath like the midrib and the cartilaginous margin; petiole red, 1.5–2.5×3–6 mm. Flowers and fruit?

Western Sierra Madre region of Mexico.

Specimens examined.—Sierra de Alamos, Sonora (*Rose, Standley & Russell, 12789*, Mar. 14, 1910, the type).

SEGOVIENSES.—Large trees with moderately stout glabrate twigs, ovoid buds with persistent stipules, rather large oblanceolate-obovate crenately dentate subsessile subglabrous leaves somewhat reticulate above and slightly granular and glabrescent beneath, and, so far as known, annual nearly sessile medium-sized fruit with rather fine acute thickened tomentose scales.—Central American region.

Leaves obtuse, obovate.....*Q. segoviensis.*
Leaves rather acute, elliptical-oblanceolate.....*Q. matagalpana.*

QUERCUS SEGOVIENSIS Liebmann.

Plate 54.

Quercus segoviensis Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 186.—Liebmann-Oersted, Chênes Amér. Trop., p. 26, pl. I.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 79.
Q. reticulata segoviensis Wenzig, Jahrb. K. Bot. Gart. Berlin, vol. 3, p. 195, 1884.

Twigs moderate (3–4 mm.), fluted, from villous soon glabrate, reddish brown becoming gray, with small pale lenticels. Buds glossy brown, glabrate, ovoid, 3×4 mm., the upper with more or less persistent ciliate stipules. Leaves deciduous?, elliptical-obovate, rather obtuse or somewhat short-acuminate, slightly cordate, crenate, especially upwards, large (6–9×10–16 cm.), glossy and glabrous or with somewhat scurfy-tomentose midrib above, paler and duller beneath with some persistent fleece in sheltered places; veins about 12×2, somewhat branching but hardly looped; petiole glabrous, 2×3 mm. Flowers and fruit.

Central American region.

Specimens examined.—Nicarauga. Segovia, at 1,300–1,600 m. (*Oersted, 3559*, the type). Honduras. Cerro Picacho, Tegucigalpa (*Niederlein*, Jan. 24, 1898); Comayagua to Sabana Larga (*Niederlein*, Feb. 23, 1898).

Quercus matagalpana n. sp.

Plate 54.

Twigs moderate (3 mm.), fluted, from scurfy-tomentose glabrescent and buff and rather glossy. Buds light brown, rather hairy, rounded, 3 mm. in diameter, with persistent stipules. Leaves deciduous, oblanceolate-obovate, obtuse or slightly acuminate, rather cuneate to the slightly cordate narrow base, crenate-dentate, large (6–9×13–15 cm.), scarcely glossy, glabrescent above, the bullate-granular lower face sparingly floccose along the veins; veins about 18–20×2, scarcely looped; petiole somewhat tomentose, scarcely 2×2 mm. Catkins?. Fruit annual?, apparently solitary and short-stalked; cup shallow-saucer-shaped, rather large (15–20 mm. in diameter), with somewhat thick-based appressed short canescent scales; acorn ovoid, 20 mm. long, covered at base only.

Central American region.—A rough-barked tree 10 m. high, with dense crown spreading 6–7 m.

Specimens examined.—Nicaragua. Monte Grande, Matagalpa, at 1,100 m. (*Rothschuh*, 611, Sept., 1894, the type, in the Berlin herbarium).

VICENTENSES.—Large subevergreen trees with rather slender quickly glabrate twigs, ovoid buds, moderate lanceolate or oblong entire short-petioled leaves glabrate and somewhat impressed veiny above and glaucous and stellate-fleecy beneath, caducous stipules, and, apparently, annual fruit solitary or 2 or 3 together at end of a short stalk.—Central American region.

Leaves at first very fleecy beneath.....*Q. vicentensis.*

Quercus vicentensis n. sp.

Twigs rather slender (2 mm.), somewhat fluted, quickly glabrescent, reddish brown becoming gray with prominent pale lenticels. Buds glossy brown, glabrescent, apparantly broadly ovoid and scarcely 4 mm. long. Leaves persisting until flowering time of the second year, lanceolate to oblong, rounded to subacute at apex, rounded at base, entire, moderate (2–3×7–10 cm.), rather dull, somewhat impressed-reticulate and quickly glabrous above except along the midrib, densely cobwebby-tomentose and very glaucous beneath; veins about 12×2, looped; petiole somewhat hairy, about 1×5 mm. Catkins: ♂, about 30 mm. long, somewhat hairy, closely flowered, the glabrous alliptic anthers exserted; ♀, somewhat hairy, scarcely 20 mm. long, few-flowered at end.

Central American region.—A large tree, called roble.

Specimens examined.—El Salvador. Moist forest on the Volcan de San Vicente, at 1,200–1,500 meters (*Standley 21593* March, 1922; the type as sheet *1137365* in the United States National Herbarium).

ARACHNOIDEAE.—Large trees with moderately stout glabrate twigs, rather large elliptical-oblanceolate incisely dentate subsessile leaves, somewhat impressed-reticulate above and sparingly cobwebby beneath.—Central American region.

Leaves subacuminate.....*Q. arachnoidea.*

Quercus arachnoidea n. sp.

Plate 55.

Twigs moderate (3–4 mm.), somewhat fluted, from villous glabrate, buff with somewhat prominent lenticels. Buds ?. Leaves deciduous ?, lanceolate to obovate, obtuse to somewhat caudately subacute, slightly cordate, rather sharply toothed above, slightly revolute, large (5–8×10–15 or 20 cm.), somewhat glossy and glabrous except for the puberulent principal veins above, lightly stellate-cobwebby and glaucous beneath; veins about 10×2, somewhat branching but hardly looped; petiole cobwebby or glabrate, scarcely 2×5 mm. Flowers and fruit ?.

Central American region.

Specimens examined.—Volcan de San Salvador, El Salvador, at 2,300 m. (*Niederlein*, Jan. 9, 1898, the type).

PRINOPSES.—Rather small trees with rather slender glabrescent twigs, round-ovoid buds, more or less persistent stipules, medium-sized lanceolate or oblanceolate somewhat coarsely serrate or crenate rather short-petioled leaves usually lightly if at all impressed-reticulate above and persistently cobwebby or mostly scurfy-tomentose beneath, and annual moderate or rather small long-stalked fruit with thin tomentose scales.—Cordilleran and adjacent table land and Eastern Sierra Madre regions of Mexico.

Pubescence cobwebby.....*Q. Rekonis.*
Pubescence rather scurfy.
  Fruit rather small; scales close and short.
    Leaves subentire to repand-serrate.
      Widest above the middle.....*Q. Martensiana.*
      Elliptical.....*f. perplexans.*
    Leaves openly serrate.....*f. Berlandieri.*
  Fruit usually larger; scales large and attenuate.
    Veins little impressed.
      Leaves lanceolate.....*Q. prinopsis.*
      Leaves oblanceolate.....*Q. chartacea.*
    Veins sharply impressed; leaves oblanceolate.....*Q. centralis.*

Quercus Rekonis n. sp.

Plate 57.

Twigs rather slender (scarcely 3 mm.), fluted, quickly glabrescent and red-brown with conspicuous white lenticels. Buds ?. Leaves deciduous ?, oblanceolate, rather obtuse, long-attenuate to the rounded base, minutely cartilaginous-revolute, entire or coarsely and repandly few-toothed toward the end, rather large (5–6 × 17 cm.), glabrous and dull bluish green above, sparsely yellowish-cobwebby beneath; veins about 12 × 2, obscurely looped; petiole cobwebby, about 8 mm. long. Catkins ?. Fruit annual, several near the end of a cobwebby peduncle 50 mm. long; cup half-round, small (about 10 mm. in diameter), with appressed thin canescent scales; acorn ovoid, fully half-included.

Cordilleran region of Mexico.

Specimens examined.—Apango, Oaxaca, at 500 m. (*Reko, 3121*, the type as sheet *892597* in the U. S. National herbarium).

Quercus Martensiana n. nom.

Plates 56 and 58.

Quercus affinis Martens & Galeotti, Bull. Acad. Brux., vol. 10, part 1, p. 222, 1843.—Not *Q. affinis* Scheidweiler, Hort. Belg., vol. 4, p. 321, pl. 17, 1837, nor of several writers on paleo-botany.

Twigs moderate (3 mm.), fluted, evanescently brownish stellate-lanate, becoming dark red or brown with conspicuous white lenticels. Buds rather dull and hairy, brown, rounded, scarcely over 2 mm. in diameter, often with persistent setaceous stipules. Leaves deciduous, oblanceolate-elliptical or oblong to obovate, obtuse, mucronate, rounded at base or slightly cordate, subentire or undulate to repandly blunt-serrate, rather large (3–5 × 12 cm.), from golden-stellate above and tawny-tomentose beneath becoming glabrous and glossy above and minutely dingy-tomentose and somewhat loosely hairy beneath with the denuded surface either somewhat bullate-roughened or smooth and glaucescent; veins about 12 × 2, obscurely looped; petiole loosely hairy, 8–10 mm. long. Catkins: ♂, about 30 mm. long, dingy-woolly, closely flowered, the somewhat hairy roundish anthers little exserted; ♀, glabrescent, equally long, few-flowered above. Fruit annual, on a glabrous peduncle 30–60 mm. long; cup half-round, moderate (some 15 mm. in diameter), with rather broad and blunt appressed thin canescent scales; acorn subglobose, half-included.

Eastern Sierra Madre region of Mexico.

Specimens examined.—Zacuapam (*Galeotti, 90*, 1840, the type of *Q. affinis* M. & G.; *Schenck, 693–4*); Mirador (*Ghiesbreght, 12, 125–8; Liebmann, 3523, 3564; Linden, 20; Ross 656*); Jalapa (*Galeotti, 3; Schiede*); Orizaba (*Botteri, 541, 1002; Bilimek, 7178; Stone, 82, 85*); without locality (*Karwinski; ?Schiede, 1095*); Guadalaxara (*Galeotti, 120*, in part); Cordillère de Guchilaque (*?Berlandier, 1147*, October, 1827, with the upper face of the crenate obtuse leaves sparsely stellate).

With broadly elliptical leaves, it may be called f. **perplexans**: Hacienda del Pacho (*Liebmann*, June 1841); and a sterile shoot with rather obovate abruptly cordate openly serrate leaves 5–9 × 10–16 cm., from between Tula and Tampico (*Berlandier, 2131*, 1832) may be known as f. **Berlandieri.**

The question must be left open, apparently, as to whether Scheidweiler (Horticulteur Belge, Oct., 1837, p. 321, pl. 18) intended to apply his name *Q. xylina*—or *xilina*, as it is spelled on the plate—to this species or to what is here called *Q. laxa*. His publication, apparently a premature naming of two of Galeotti's oaks which had come into his hands, leaves little doubt that he meant by his *affinis* not this white oak to which Martens and Galeotti applied the name shortly after, but the black oak which they called *nitens*. The fact that Martens and Galeotti did not recognize or admit seeing the latter in Scheidweiler's characteristic figure may be correlated, perhaps, with their failure to identify their own *affinis* with his less representative figure of *xilina* when making the suggestion (Bull. Acad. Brux., vol. 10, part 2, p. 221) that it

might be *Q. reticulata*. Though this latter can not be true, the Scheidweiler figure of *xylina* is more suggestive of the species which Liebmann, much later, called *Q. laxa*, and which, like the other species named by Scheidweiler, is represented in the Galeotti collections.

Quercus prinopsis n. sp.

Plate 58.

Twigs slender (2 mm.), somewhat fluted, from dingy-hairy glabrate and rather glossy brown with prominent pale lenticels. Buds glossy red-brown, glabrescent, ovoid, 2×3 mm. Leaves deciduous, lance-elliptical, acute or the tapered apex callous-obtuse, rounded at base or slightly cordate, subentire or undulate to typically coarsely serrate with blunt callous-tipped teeth, rather small (2–3×7–9 cm.), glabrous and very glossy above, finely but densely and persistently gray or creamy stellate-tomentose beneath; veins about 10–12×2, obscurely if at all looped; petiole yellow-tomentose, 1.5×5 mm. Catkins ?. Fruit annual, several at end of a tomentose peduncle 2×40 mm.; cup half-round, small (10 mm. in diameter), with thin somewhat loose acute puberulent scales; acorn subglobose, striately ridged, nearly included.

Mexican table-land.

Specimens examined.—Pelote, San Luis Potosi (*Purpus, 4941*, Nov., 1910, the type). About San Luis Potosi (*Schaffner, 899*).

Quercus chartacea n. sp.

Plate 59.

Twigs moderate (3 mm.), little fluted, evanescently golden stellate-fleecy, red-brown with conspicuous white lenticels. Buds red-brown, glabrate, ovoid, 2×3 mm. or more, the uppermost with setaceous stipules. Leaves partly evergreen, elliptical to broadly lanceolate or obovate, acute or submucronate to obtuse or emarginate, rather round at base, entire or repand or serrate, rather large (4×9 to mostly 6–8×12–14 cm.), glossy green and essentially glabrous above, closely and rather tightly dingy-tomentose beneath; veins about 10–12×2, red, ending in short callous tips, forking but scarcely looped; petiole red, glabrate, 2–3×5–10 mm. Catkins: ♂, hardly 30 mm. long, rusty-floccose, closely flowered, the round glabrous anthers little exserted. Fruit annual, one or several on a scurfy or glabrescent peduncle 2×20–40 mm.; cup half-round, moderate (about 15 mm. in diameter), with rather thin staring acute rusty-tomentose brown scales; acorn ovoid, fully half-included.

Cordilleran region of Mexico.—A tree, called encino amarillo.

Specimens examined.—Oaxaca. Salome, Cuicatlan (*Seler, 62*, June, 1888, the type), Mixteca Alta at 2,300–2,900 m. (*Galeotti, 101* in the Paris herbarium, and—? through change of labels—*102* in the Delessert herbarium); Tecomatlan (*Seler, 1593, 1594*, with leaves more sharply toothed above, as in *reticulata*); Tecomatlan to Pueblo Viejo (*Conzatti, 1901*); Las Sedas (*Conzatti, 1807*); Huauhtilla (*Seler, 1587*); S. Carlos, Yauhtepec (*Seler, 1631, 1761*, with nearly sessile leaves, called chaporro); Jayacatlan (*?Rusby, 1910*). Chiapas. Cuesta de S. Fernando (*?Seler, 1853*).

Quercus centralis n. sp.

Plate 60.

Twigs rather slender (2–3 mm.), scarcely fluted, from yellow- or gray-pilose glabrescent and reddish with pale lenticels. Buds ?. Leaves deciduous, acutely oblanceolate to obtusely obovate, rounded at base or subcordate, crenate to coarsely serrate with callous-tipped teeth, moderate (3–4×6–8 cm. or more), glabrous and rather glossy above, more or less scurfy-tomentose beneath; veins about 10×2, scarcely looped; petiole tomentose, about 1×5 mm. Catkins: ♂, 50–70 mm. long, laxly flowered, loosely hairy, the rounded mostly hairy anthers somewhat exserted. Fruit annual, usually several at end of a glabrescent peduncle 2×10–80 mm.; cup flaring saucer-shaped, rather large (15–20 mm. in diameter), with thin somewhat loose acute puberulent scales; acorn ovoid, nearly half-included.

Cordilleran region of Mexico.—A tree 5–6 m. high.

Specimens examined.—Contreras (*Endlich, 1365c*, the type, called encino); Cañada Grande (*Ross, 159, 172*); Valley of Mexico (*Bourgeau, 426, 1069; Pringle, 10394–5, 13976*); Hacienda de la Encarnacion (*Rose, Painter & Rose, 8438*); Rio Hondo Cañon (*?Pringle, 7540*, with glabrous anthers); Jordana, near Toluca (*Gregg, 724*, with hairy anthers); Tochimilco, Puebla (*?Nelson, 1893*); Cerro Tepoxuchil, Puebla (*Arsène, 195, 5924, 7052, 7131*); without locality (*?Leibold, 237*).

One branchlet of *Arsène, 7052*, is heteroplyllous, with some reduced entire oblong leaves scarcely 1×3 cm.—f. **heterophylla**.

PANDURATAE.—Rather small trees with somewhat slender tomentose or glabrescent twigs, round-ovoid buds, mostly deciduous stipules, medium-sized or rather large oblong-oblanceolate or obovate somewhat panduriform mostly crenate or undulate moderately petioled leaves rather lightly impressed-reticulate above and usually persistently sparingly velvety beneath, and annual moderately small long-stalked fruit with tomentose scales keeled or somewhat thickened at base.—Western Sierra Madre region of Mexico.

Scales of cup bluntly keeled.
- Leaves blunt, rather oblong.....*Q. obtusata.*
- Leaves acute, broadened upwards.....v. *pandurata.*

Scales of cup rather thickened at base.
- Leaves merely repand-toothed, obtuse.
  - Green-veined, downy beneath.....*Q. panduriformis.*
  - Red-veined, glabrate.....f. *rubrinervis.*
- Leaves rather serrate-lobed, acute.....f. *colimensis.*

QUERCUS OBTUSATA Humboldt & Bonpland.

Plates 61 and 62.

Quercus obtusata Humboldt & Bonpland, Plant. Aequinoct., vol. 2, p. 26, pl. 76, 1809.—A. de Candolle in de Candollé, Prodromus, vol. 16, part 2, p. 27, 1864.

Twigs slender (2–3 mm.), somewhat fluted, from rather sparingly scurfy becoming nearly glabrous and gray. Buds at first brown- or gray-fleecy, round-ovoid, 2 mm. in diameter. Leaves deciduous?, oblanceolate-oblong, obtuse, rounded at base, low-undulate, somewhat crisped, rather large (3–6×10–20 cm.), glabrescent above, finely stellate-scurfy beneath; veins about 12–15×2, branched, rather obscurely looped; petiole stellate-tomentose, 1.5×10–20 mm. Catkins?. Fruit annual, terminating or clustered along a stellate peduncle 2–3×50–90 mm.; cup rounded, moderate (about 15 mm. in diameter), with rather strongly thick-keeled appressed narrow acute canescent scales; acorn (immature) depressed, as yet nearly included.

Western Sierra Madre region of Mexico.

Specimens examined.—Ario, Michoacan (*Bonpland, 4329*, the type); Road to Colima (*?Ross, 519*).

With rather shorter subpandurate somewhat acute leaves it is var. *pandurata* A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 27, 1864.—*Q. pandurata* Humboldt & Bonpland, Plant. Aequinoct., vol. 2, p. 28, pl. 77, 1809; Ario (*Bonpland, 4330*, the type; *Galeotti, 120; Heilprin & Baker, 3*); without locality (*Martius' herbarium*, at Brussels).

Quercus panduriformis n. sp.

Plates 62 and 63.

Twigs moderate (about 3 mm.), somewhat fluted, rather persistently tomentose, with conspicuous pale lenticels. Buds glabrate, ovoid, 2–3×3–5 mm. Leaves deciduous?, broadly elliptical or obovate, typically obtuse, rounded at base, more or less pandurately narrowed, repand or in one form almost lobed, large (5–10×10–20 cm.), rather thick and firm, glossy green and from puberulent glabrescent above, sparingly tomentose beneath; veins about 8–10×2, at most obscurely looped: petiole puberulent, some 5 mm. long. Catkins?. Fruit annual, mostly paired on tomentose peduncles 10–25 mm. long; cup deeply saucer-shaped, moderate (15 mm. in diameter), with close acute pale-tomentose scales rather tuberculate at base: acorn ovoid, less than half-included.

Western Sierra Madre region of Mexico.—A large tree.

Specimens examined.—El Chuen, Ario de Rosales (*Endlich, 1357*, the type, called encino); Sta. Maria, Morelos (*Ross, 245*); San Salvador (*Langlassé, 239*); Lake Chapala, Jalisco (*Pringle, 5988, 7072*); Cerro Grande, Jalisco (*Burnett*, 1913, lumbermen recognizing two forms—roble negro, of crooked growth, with square-checked gray bark and chocolate or blackish heartwood; and roble blanco or alveano, growing straighter with a clear trunk nearly 1 m. in diameter and over 20 m. to the branches, less checked bark, and browner wood).

With subspatulate crenate very red-veined glabrate leaves, it is f. **rubrinervis** (*Langlassé, 600*, called encino roble, and *573*, called encino tocus). With more lanceolate acute and deeply toothed or lobed leaves, it is f. **colimensis** (*Ross, 497*).

MACROPHYLLAE.—Moderately large trees with stout tomentose twigs, ovoid buds with persistent stipules, very large subsessile crisped crenate obovate leaves lightly impressed-reticulate and more or less glabrescent above and shortly pale-tomentose beneath, and annual large moderately stalked fruit with rather thickened tomentose scales.—Over the Sierra Madre and table-land of Mexico, and in Central America.

Leaves glabrate above, broadly obovate. Guatemala..... *Q. purulhana.*
Leaves rather persistently puberulent above. Mexico.
Broadly obovate, very obtuse..... *Q. macrophylla.*
Oblanceolate-obovate, often subacute..... *Q. resinosa.*

Quercus purulhana n. sp.

Plate 64.

Twigs rather stout (about 5 mm.), somewhat fluted, glabrate, reddish, with conspicuous pale lenticels. Buds dingy-hairy, with persistent stipules. Leaves deciduous, elliptical-oblong to broadly obovate, very obtuse or in the narrower forms sometimes acuminate, slightly cordate, more or less crisped, crenate, large (5–6×10–12, or even 15×22 cm.), glabrate above, finely pale-tomentose beneath; veins about 10–12×2, scarcely looped; petiole tomentose, scarcely longer than thick. Catkins: ♀, 40 mm. long, thick, densely stellate, several-flowered above the middle. Fruit ?.

Central American region.

Specimens examined.—GUATEMALA. Quililha, near Purulha (*Pittier, 163*, the type); Rabinal (*Cook, 15*); Sta. Rosa to Salamà (*Cook, 266.*).

QUERCUS MACROPHYLLA Née.

Plates 65 to 67.

Quercus macrophylla Née, Anal. Cienc. Nat., vol. 3, p. 274, 1801.
Q. magnoliaefolia macrophylla A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 27, 1864.

Twigs stout (6 mm.), fluted, from yellow-felted glabrescent, buff or brown. Buds glabrescent and rather glossy brown from dingy-hairy, ovoid, sometimes as much as 6×10 mm., the terminal with persistent stipules. Leaves deciduous, broadly obovate, very obtuse, rounded at base or shallowly cordate, undulately crenate or almost crenately lobed to obtusely rather serrate, very large (13–20×25–30 cm., 30×40 cm., or more), crisped, from somewhat stellate nearly glabrate and rather glossy green above, mostly very persistently dingy-tomentulose beneath; veins about 15×2, more or less forking, scarcely looped; petiole mostly short-tomentose, 3–4×5 mm. Catkins: ♂, 100 mm. long, densely yellowish-pilose, rather closely flowered, the loosely hairy ellipsoid anthers little exserted; ♀, 20–40 mm. long, thick, velvety, several-flowered toward the end. Fruit annual, usually 2 or 3 near the end of a stout yellow-tomentose peduncle from scarcely 15 to sometimes 100 mm. long; cup flat-goblet-shaped or shorter, large (25–30 mm. in diameter), with rather thin appressed yellow-tomentose and fringed acute scales, or their glabrescent tips spreading somewhat; acorn elongated, 35 mm. long, scarcely half-included.

Western Sierra Madre region and table-land of Mexico.—A tree 10 m. high; the type materials collected on the road from Tixtla to Chilpancingo, and in the Cerro de Omiapa.

Specimens examined.—Morelia, Michoacan (*Arsène, 2759*); Guadalajara, Jalisco (*Pringle, 5357, 6220*); Bolaños, Jalisco (*Rose, 3001*); Jaral, Coahuila (*Schumann, 1312*, from which the inflorescence is described); Sta. Rosa (*Bonpland, 4405*); Guanajuato (*Dugès, i*); without locality (*? Uhde 271; Mrs. Ward*); vicinity of San Luis Potosi (*Parry & Palmer, 1878*).

QUERCUS RESINOSA Liebmann

Plate 68.

Quercus resinosa Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 182.
Q. magnoliaefolia macrophylla, in part, A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 27, 1864.

Twigs stout (4–6 mm.), more or less fluted, rather persistently tomentose, with pale lenticels when glabrescent. Buds ?. Leaves deciduous, oblanceolate-obovate, very obtuse to subacute, slightly cordate, crisped and repand, large (10–15×20–30 cm.), glabrescent above, finely gray-puberulent beneath and somewhat resinous along the veins; veins about 12–15×2, scarcely looped; petiole tomentose, little longer than thick.—Flowers and fruit ?.

Western Sierra Madre region of Mexico.

Specimens examined.—Without precise locality (*Seemann, 1972*, the type, in the Hookerian herbarium at Kew).

POCULIFERAE.—Moderately large trees with rather slender glabrate twigs, somewhat persistent stipules, rather large moderately stalked undulate or low-crenate leaves widened upward and somewhat pandurately contracted, glabrous or resinous along the midrib and lightly raised-venulose above and more or less scurfy beneath, and annual rather large short-stalked fruit, the thick cup with rather thin appressed felted scales. Cordilleran region of Mexico.

Leaves obovate sub-pandurate, rather blunt.....*Q. Poculifer.*

Quercus Poculifer n. sp.

Plate 69.

Twigs rather slender (2–3 mm.), little fluted, nearly glabrous and rather dull, light brown with conspicuous pale lenticels. Buds very light dull brown, more or less persistently loosely hairy, rounded, 2 mm. in diameter, the upper with rather persistent stipules. Leaves deciduous ?, elongated obovate, obtuse or short-acuminate, slightly cordate to typically acute at base, low-repand or crenate above, rather large (6–12×12–16 cm.), glossy, glabrous and finely raised-veiny above or the midrib somewhat resinous-puberulent, the lower surface pale, dull, low-bullulate and sparingly to densely stellate-pubescent; veins about 12–15×2, rather obscurely looped; petiole bright red, glabrescent, about 2×10 mm. Catkins ?. Fruit annual, solitary and nearly sessile; cup shallow-goblet-shaped when fully developed, thick, large (25–30 mm. in diameter), with rather thin appressed slender-pointed closely gray- or red-felted scales; acorn ellipsoid, 25 mm. long, glossy chestnut, half-included.

Cordilleran region of Mexico.—A tree about 7 m. high.

Specimens examined.—Oaxaca. Las Sedas (*Pringle, 4760*, Aug. 1, 1894, the type). Puebla. Cerro de Paxtla (*Schenck, 240*).

CIRCINATAE.—Moderately large trees with moderate mostly glabrescent twigs, round-ovoid buds sometimes with persistent stipules, rather large usually short-petioled flat generally undulate leaves, widened upwards and sometimes pandurately contracted, glabrate and lightly impressed-reticulate above and pale-tomentulose or glabrate beneath, and annual moderate and moderately stalked fruit with slightly thickened tomentose scales.—Western Sierra Madre and Cordillera of Mexico.

Leaves oblanceolate-obovate, blunt-acuminate, glabrescent.....*Q. nudinervis.*
Leaves oblanceolate, tomentulose beneath.
  Blunt-acuminate, undulate.....*Q. circinata.*
  Scarcely pointed.....*Q. magnoliaefolia.*

Leaves obovate-oblanceolate, somewhat pandurately narrowed, tomentulose beneath.
Scarcely undulate, very short-petioled.
Yellow-tomentulose beneath; twigs glabrescent.....*Q. lutea.*
Gray-tomentulose beneath, red-veined; twigs tomentulose.....*Q. haematophlebia.*
Crenate.
Petiole elongated.....*Q. Liebmannii.*
Petiole short.....f. *brevipes.*

QUERCUS NUDINERVIS Liebmann.

Plate 70.

Quercus nudinervis Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 182.—Liebmann-Oersted, Chênes Amér. Trop., p. 25.
Q. obtusata Hartwegi in part, A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 27, 1864.

Twigs moderate (3–4 mm.), little fluted, glabrous, dull brown or rather dark with conspicuous pale lenticels. Buds glossy brown, glabrous, round-ovoid, 3×4 mm., the stipules deciduous. Leaves deciduous, obovate or oblanceolate, obtuse to bluntly acuminate, rather rounded at base or decurrent on the petiole, low-crenate, large (5–9×13–17 cm.), glossy, glabrous, and finely impressed-reticulate above, dull, glabrescent, and very prominently reticulate beneath, the surface bullate-granular; veins about 15×2, passing into minute marginal callosities, rather obscurely looped; petiole dark red, glabrous, 5–8 mm. long. Flowers and fruit?.

Western Sierra Madre region of Mexico.

Specimens examined.—Cerro de Pinal (*Seemann, 1457*, the type, in the Hookerian herbarium at Kew; also seen in the Gray herbarium).

QUERCUS CIRCINATA Née.

Plate 71.

Quercus circinata Née, Anal. Cienc. Nat., vol. 3, p. 272, 1801.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 26.

Twigs stout (4–6 mm.), little fluted, from minutely dingy-tomentose rather tardily glabrescent and brown with prominent pale lenticels. Buds brown, for a time canescent, rounded, 3–4 mm. in diameter, the stipules deciduous. Leaves deciduous, oblanceolate, bluntly subacuminate, rounded at base, rather serrately crenate with very blunt teeth, large (6–10×15–25 cm.), glossy and glabrescent above except for the velvety-puberulent midrib, minutely yellowish-rusty velvety beneath; veins about 15–20×2, rather obscurely looped; petiole rusty-puberulent, 3×10 mm. Catkins?. Fruit annual, somewhat spaced on a minutely scurfy peduncle 2×8–10 mm.; cup half-round or goblet-shaped, rather large (20 mm. in diameter), with thin appressed acute densely tomentulose scales; acorn 20–30 mm. long, scarcely one-third included.

Western Sierra Madre and adjacent table land of Mexico.—A gray-barked tree 7–8 m. high. The type was from between Tixtla and Chilpancingo; what was considered as a form of it also noted as along the route from the Rio Azul to Tixtla, and between Chilpancingo and Sta. Rosa, at three leagues from Guanajuato.

Specimens examined.—Cerro Baldoquin, Ario de Rosales (*Endlich, 1352*); Ario to Patzcuaro (*Heilprin & Baker, 2, 4, 5,*); La Joia (*Langlassé, 86*); Hacienda Coahuayula, Michoacan (*Emrick, 19, 63*); Foothills, Rosario to Colomas, Sinaloa (*Rose, 1644*); without locality (*Haenke, 270*, perhaps the equivalent of a cotype).

QUERCUS MAGNOLIAEFOLIA Née.

Plate 72.

Quercus magnoliaefolia Née, Anal. Cienc. Nat., vol. 3, p. 268, 1801.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 26.
Q. magnolifolia Sprengel, Syst., vol. 3, p. 857, 1826.—A typographic error.
Q. macrophylla Liebmann-Oersted, Chênes Amér. Trop. pl. I.

Twigs rather stout (3–5 mm.), fluted, from loosely villous glabrescent, somewhat reddish with small prominent pale lenticels. Buds gray-hairy or glabrescent and dull brown, round-

ovoid, some 3 mm. in diameter, the uppermost for a time with persistent linear ciliate stipules. Leaves deciduous, oblanceolate-obovate, obtuse or acute, rounded at base or slightly cordate, entire or very low repand, large (8–10×15–25 cm.), rather thin and flat, slightly glossy and glabrescent above except for the scurfy midrib, paler and brown beneath with lax stellate yellowish pubescence or at last nearly glabrous except for the rather pilose midrib, etc.; veins about 12–15×2, often forked but scarcely looping; petiole slightly pilose, 5–10 mm. long. Catkins: ♂, about 30 mm. long, at first fleecy, loosely flowered, the hairy rounded anthers little exserted. Fruit annual, solitary or paired at end of a peduncle 2×15 mm. or subverticillate on a stalk of double this length; cup hemispherical, small (scarcely 10 mm. in diameter), with thin appressed tomentose acutish scales; acorn (immature) ovoid, scarcely 12 mm. long, as yet half-included or more.

Western Sierra Madre region of Mexico, the types from between Chilpancingo and Tixtla.

Specimens examined.—Without locality (*Pavon*, in the Boissier herbarium—very probably a cotype actually collected by Née; Sta. Maria, near Cuernavaca (*?Ross, 250*); Chiquilistlan, Jalisco (*Jones, 441, 442, 444*).

QUERCUS LUTEA Née.

Plate 73.

Quercus lutea Née, Anal. Cienc. Nat., vol. 3, p. 268, 1801.
Q. flava Sprengel, Systema, vol. 3, p. 857, 1826—by error for *lutea*.
Q. magnoliaefolia lutea A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 27, 1864.

Twigs moderate (3–4 mm.), glabrescent, fluted. Buds rounded, rather small. Leaves deciduous, pandurately obovate-oblanceolate, very obtuse, rounded or subcordate at base, low-repand, large (8–9×19 cm.), rather flat, glabrescent above, yellow-tomentose beneath; veins about 15×2, somewhat looped; petiole scarcely 5 mm. long. Flowers and fruit?.

Western Sierra Madre region of Mexico.—The type from between Chilpancingo and Tixtla.

Specimens examined.—S. Leonel, Tepic (*Gregg, 976*).

Quercus haematophlebia n. sp.

Plate 74.

Twigs moderate (3–4 mm.), little fluted, from gray-fleecy glabrescent and grayish with small prominent lenticels. Buds glossy brown, at length glabrate, rounded, 2 mm. in diameter, the upper with more or less persistent stipules. Leaves deciduous, oblanceolate to obovate, very obtuse or blunt-pointed, frequently emarginate, the often somewhat pandurately contracted base rounded, slightly repand, rather large (5–6×10–13 cm.), glossy green though sparsely fine-velvety and somewhat reticulately impressed above, dingy short-fleecy beneath; veins about 12×2, ending in minute callous tips mostly in the sinuses, nearly simple, scarcely looped, blood-red on both faces under the fine gray pubescence; petiole canescent, scarcely 3 mm. long. Catkins?. Fruit annual, paired on peduncles scarcely 20 mm. long; cup half-round, rather large (nearly 20 mm. in diameter), with rather thin and close broad pointed gray-tomentose scales; acorn round-ovoid, about half-included, very scurfy at top.

Western Sierra Madre region of Mexico.

Specimens examined.—Dolores, Tepic (*Rose, 3363*, Aug. 6–7, 1897, the type in U. S. National herbarium, as sheet no. *302339*).

Quercus Liebmannii Oersted n. sp.

Plate 75.

Quercus Liebmannii Oersted in Liebmann-Oersted, Chênes Amér. Trop., p. 16, pl. I, 33, 1869.—Name only.

Twigs moderate (3 mm.), fluted, glabrescent, reddish with evident pale lenticels. Buds straw-colored, from hairy glabrescent, rounded, 2–3 mm. in diameter, with long narrow persistent stipules. Leaves deciduous?, oblanceolate, bluntly subacuminate, rounded at base or slightly cordate, rather deeply crenate-sinuate, large (5–7×13–17 cm.), thin and flat, rather

glossy green and glabrous above; finely pale-tomentose beneath except for the veins; veins about 15×2, not looped; petiole glabrescent, 1.5×5–10 mm. Flowers and fruit?.

Cordilleran region of Mexico.

Specimens examined.—Oaxaca. Cuesta de S. Juan del Estado (*Liebmann, 89, 3505, 5742*, May 1842, the type); Mixteca Alta (*?Galeotti, 110*); Cerro de S. Felipe (*Liebmann, 3526*, a short-petioled form, f. **brevipes**).

PEDUNCULARES.—Moderate-sized trees with moderate loosely tomentose or rather villous twigs, mostly persistent stipules, medium-sized oblanceolate-elliptical or obovate crenate or coarsely serrate short-petioled leaves impressed-reticulate above and persistently rather loosely short-tomentose beneath, and annual moderate usually long-stalked more or less fluted fruit with tomentose scales.—Central American and western Sierra Madre regions.

Cup half-round; leaves obovate, low-undulate.....*Q. Barbeyana.*
Cup rather shallow; leaves mostly elliptical-oblanceolate and toothed.
  Twigs rather staringly hairy.
    Leaves oblanceolate.
      Crenate-undulate.....*Q. pilicaulis.*
      Coarsely serrate.....f. *macrodonta.*
    Leaves elliptical-obovate.
      Bluntly crenate.....f. *obovalis.*
      Pungently repand.....f. *armata.*
      Nearly entire.....f. *Hurteri.*
  Twigs loosely tomentose.
    Leaves coarsely serrate.
      Anthers hairy.....*Q. barbanthera.*
      Anthers glabrous.....v. *calva.*
    Leaves crenately repand.
      Oblanceolate.....*Q. callosa.*
      Elliptical-oblong.....*Q. peduncularis.*

Quercus Barbeyana n. sp.

Plate 76.

Twigs moderate (3–4 mm.), somewhat fluted, persistently yellow-fleecy through most of the first season and sometimes hoary in later years. Buds yellow-hairy, rounded, about 2 mm. in diameter, the terminal larger and surrounded by persistent stipules. Leaves deciduous, obovate, very obtuse, gradually narrowed to the subcordately rounded base, very low-crenate, large (7–10×12–16 cm.), glabrous and glossy above except for some yellow tomentum along the principal veins, densely and tightly short-brown-tomentulose beneath; veins about 15×2, exceptionally forking, scarcely looped, passing toward the sinuses; petiole yellow-tomentulose, 2×3 mm. Catkins?. Fruit annual, mostly 3 or 4 toward the end of a yellow-tomentose or partly glabrate peduncle 2×40–70 or 100 mm.; cup half-round, rather large (15–20 mm. in diameter), with thin appressed acute yellow-hairy scales; acorn ovoid, chestnut-colored, corrugated at base and depressed at apex, about half exserted.

Central American region.

Specimens examined.—Guatemala. Ipala to Amatillo, at 1,000–1,400 m. (*Lehmann, 1711*, July 12, 1882, the type, in the Barbey-Boissier herbarium, now at the University of Geneva); Salamà to Rabinal (*Cook & Doyle, 280, 286*, with the lower leaf-surface in part denuded).

Quercus pilicaulis n. sp.

Plates 3, 4, and 77 to 80.

Quercus tomentosa abbreviata A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 33, 1864.

Twigs moderate (3 mm.), somewhat fluted, for a time covered with long loose staring yellow hairs. Buds red-brown, glabrescent, round-ovoid, 2×3 mm., the upper with persistent stipules. Leaves deciduous?, elliptical-oblanceolate or obovate, rather acute, rounded at base, rather deeply crenate, rather large (4–8×10–16 cm.), glossy and glabrous above except

for the somewhat scurfy or pilose midrib, sparingly pale-fleecy beneath; veins about 10×2, little branched and scarcely looping; petiole yellow-villous, about 2×5 mm. Catkins ?. Fruit annual, paired at end of a more or less staringly hairy peduncle scarcely 4 to as much as 40 mm. long; cup rather shallow, moderate (15 mm. in diameter), with thin appressed acute yellow-tomentose scales; acorn ovoid, 15 mm. long, less than one-third included.

Central American region.

Specimens examined.—Guatemala. Without locality (*v. Warscewicz, 43;* the type and the type number of *Q. tomentosa abbreviata, 17, 19, 30*); Cerro Quemado, Quezaltenango (*Kellerman, 5922*).

More deeply serrated, it is f. **macrodonta** (*v. Warscewicz, 15*, the type number of *Q. tomentosa bullata*, A. de Candolle, *l. c.*, which does not have constantly the scale characters ascribed to it). With more deeply crenate obovate or subpanduriform leaves and small cups, it is f. **obovalis:** (*v. Warscewicz, 18*); Chinaltenango (*Lehmann, 1725*); Sapote (*Smith, 1968*). With broadly obovate subentire leaves and clustered fruits it is f. **Hurteri:** Quezaltenango (*Trelease, 32, 34, 35, 37*). With pungently repand-dentate or serrate obovate obtuse or acute leaves 9×13 cm., resembling those of the black-oak *Q. crassifolia*, this becomes f. **armata:** Volcan de Sta. Maria (*Nelson, 3721*, Jan. 24, 1896); Quezaltenango (*Trelease, 33, 36, 39–42*).

Quercus barbanthera n. sp.

Plate 81.

Twigs rather slender (2–3 mm.), little fluted, from golden-villous becoming gray, or glabrate and rather glossy brown with small lenticels the second year. Buds evidently rather dull brown and glabrescent. Leaves deciduous (immature), subelliptical, acutish, obtuse at base or subcordate, serrate, large (4×10 cm. before the end of the flowering season), caducously golden stellate-fleecy above, densely rusty-matted beneath: veins about 8×2: petiole very hairy, 2×5 mm. Catkins: ♂, becoming 70–100 mm. long, rusty-fleecy, loosely flowered, the loosely hairy globose anthers little exserted; ♀, equally long, with one or two sets of flowers above the middle. Fruit ?.

Central American region.

Specimens examined.—Guatemala. **Road to Petapa** (*Skinner*, 1845). Mexico. Chiapas (*Seler, 2586*, the type).

What for the present must be regarded as a form of this, with longer ellipsoid apiculate glabrous anthers, may bear the varietal name **calva:** Guatemala. Garrucha, at 1,500 m. (*Heyde & Lux, 3152*); Chiquin to Trapiche Grande (*Pittier, 130*).

QUERCUS CALLOSA Bentham.

Plate 82.

Quercus callosa Bentham, Plant. Hartweg, p. 91, 1842.

Twigs moderate (3 mm.), little fluted, yellow- or finally gray-fleecy at least through the first season, brownish when denuded. Buds yellow-hairy, rounded, about 2 mm. in diameter, with persistent stipules. Leaves subdeciduous, obovate to oblanceolate, acute to typically obtuse, rounded at base, low-crenate, moderate (2.5–4×7–10 cm.), slightly glossy and glabrous above, except for some yellow tomentum along the midrib or toward the base, brown- or finally gray-floccose beneath; veins about 10×2, scarcely forked or looping; petiole tomentose, about 2×5 mm. Catkins: ♂, 30 mm. long, lanate, rather closely flowered, the short rounded glabrous anthers little exserted. Fruit annual, paired or verticillate on a very tomentose peduncle 2×25–40, 70, or even 120 mm.; cup rather shallow but large (15–20 mm. in diameter), with somewhat thickened appressed acute very woolly scales; acorn ovoid, 20 mm. long, scarcely half-included.

Central American region.

Specimens examined: Guatemala. Las Casillas (*Hartweg, 616*, the type); Uaxac Canal (*Seler, 2668*); Rabinal (*Cook, 13*); Finca Sepacuite (*Cook & Griggs, 574*); Sierra de las Minas

(*? Kellerman, 7032, 8043*); El Rancho (*? Kellerman, 5658*); about Guatemala City (*Hayes*, 1860; *Trelease, 50*); Mixco (*Trelease, 48, 49*); Eureka (*Trelease, 61*); Salamà to Rabinal (*Cook & Doyle, 285*). Honduras. Comayagua to Sta. Rosa (*Scherzer*, 1853). Mexico. Comitan, Chiapas (*Hartweg, 564*, the first citation under *Q. tomentosa communis* A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 33, 1864).

QUERCUS PEDUNCULARIS Née.

Plates 83 and 86.

Quercus peduncularis Née, Anal. Cienc. Nat., vol. 3, p. 270, 1801.
Q. tomentosa Willdenow, Sp. Plant., vol. 4, p. 437, 1805.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 33.

Twigs moderate (3 mm.), scarcely fluted, from reddish- or dingy-scurfy or villous glabrescent, buff or gray with rather prominent lenticels. Buds rather persistently hairy, ovoid, 2×3 mm. Leaves deciduous?, elongated- or lance-elliptical, rather acute, somewhat cordate, sinuate with short callous points in the sinuses, rather large (5×12 cm.), somewhat glossy and glabrous above, except for the scurfy midrib, rather thinly dingy stellate-tomentose beneath; veins about 10×2, passing into the mucros, obscurely looped; petiole tomentose, 2×5 mm. Catkins?. Fruit annual, paired toward the end of a tomentose peduncle some 2×30 mm., cup rather shallow, moderate (12–15 mm. in diameter), with thin appressed acute rusty-tomentose scales; acorn ovoid, less than half-included.

Western Sierra Madre region of Mexico, the type from the road between Acapulco and Mexico City, above the Rio Mescala.—A gray-barked much-branched tree not over 7 m. high.

Specimens examined.—Without locality (*Herb. Thibaud*, in the Candollean herbarium, supposedly a cotype derived from Née; *Pavon*, very probably also a cotype collected by Née; *Bonpland, 3937*).

Hardly placeable elsewhere are specimens from the Cordilleran region: Yavesia (*Liebmann, 201, 3524*); Consoquitla (*Liebmann, 3565*); Las Sedas (*Pringle, 4762*). Fruits of "*Q. tomentosa*" in the Copenhagen herbarium, without data but no doubt of one of the Liebmann collections here noted, show the mature fruit of this form to have a cup varying from saucer-shaped to half-round, and ovoid acorns 15×20 mm., covered at the base only.—Willdenow did no more than replace the name *peduncularis* because of its similarity to *pedunculata*, which was already in use for another species.

LAXAE.—Moderate-sized trees with moderate at first tomentose twigs, ovoid buds, the upper with persistent stipules, elliptical-obovate repand rather short-petioled leaves impressed-reticulate above and somewhat scurfy or velvety-tomentose beneath, and annual rather long- and thick-stalked moderately large fruit with thin acute rather loose tomentose scales.—Western Sierra Madre region of Mexico.

Cup rather large (20–25 mm.).
  Pubescence persistent.....*Q. Hartwegi.*
  Glabrescent.....*f. glabrata.*
Cup smaller (15 mm.).....*Q. laxa.*

QUERCUS HARTWEGI Bentham.

Plate 84.

Quercus Hartwegi Bentham, Plant. Hartweg., p. 432, 1840.—Oersted, Bidrag Kundsk. Egefamil., pl. 3.
Q. obtusata Hartwegi, in part, A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 27, 1864.
Q. pandurata Hartwegi Wenzig, Jahrb. K. Bot. Gart. Berlin, vol. 3, p. 197, 1884.

Twigs moderate (3–4 mm.), scarcely fluted, from somewhat villous-tomentose glabrescent and grayish with rather prominent small lenticels. Buds rather persistently hairy, ovoid, 2×3 mm., the upper with more or less persistent setaceous stipules. Leaves deciduous, elliptical or somewhat obovate, obtuse, slightly cordate, repand to coarsely subserrate, moderate (4–5×7–8 cm.), somewhat glossy and glabrate above except along the midrib, rather sparingly

and finely stellate-velvety beneath; veins about 10×2, irregularly if at all looped; petiole pubescent, 5–10 mm. long. Catkins: ♂, as much as 60 mm. long, sparingly hairy, loosely flowered, the glabrous broadly ellipsoid anthers well exserted. Fruit annual, scattered or subapical on a sparsely stellate peduncle 2×30–90 mm.; cup flaring-saucer-shaped, rather large (20–25 mm. in diameter), with rather thin and lax acute puberulent scales; acorn round-ovoid, scarcely 15 mm. long, half-included.

Western Sierra Madre region of Mexico.

Specimens examined.—Tuspan, near Anganguio (*Hartweg, 432*, the type); Tiristiran, between Morelia and Zamora (*?Gregg, 796*, with closely-flowered staminate catkins 20 mm. long, the rounded hairy anthers little exserted); Cerro Azul, Morelia, Michoacan (*?Arsène*, 1911); Loma Sta. Maria, Morelia (*Arsène, 2935*); Monterrubio, Morelia (*Arsène, 6018*). A quickly glabrate form, f. **glabrata,** from which the catkins are described, is cultivated at the Cambridge Botanical Garden in England (*Henry*) from acorns said to have been collected by Hartweg.

QUERCUS LAXA Liebmann.

Plate 85.

Quercus laxa Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 181.—Liebmann-Oersted, Chênes Amér. Trop., p. 25, pl. 37.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 28.
Q. reticulata laxa Wenzig, Jahrb. K. Bot. Gart. Berlin, vol. 3, p. 195, 1884.
?Q. xylina Scheidweiler, Horticulteur Belge, vol. 4, p. 321, 1837.
?Q. xilina Scheidweiler, *l. c.*, pl. 18.

Twigs moderate (3–4 mm.), somewhat fluted, from loosely subvillous glabrescent and grayish with rather prominent lenticels. Buds rather persistently hairy, ovoid, 2×3 mm. Leaves deciduous?, obovate, very obtuse, more or less obliquely rounded at base, low-repand, moderate (3 or mostly 5×6–8 cm.), glabrescent or somewhat scurfy above especially along the midrib, rather thinly stellate-tomentose beneath; veins about 12×2, obscurely if at all looped; petiole hairy, 2×5–10 or even 15 mm. Catkins?. Fruit annual, subterminal or scattered on a tomentose peduncle 1.5×60–100 mm.; cup half-round, moderate (15 mm. in diameter), with somewhat keeled rather close acute finely tomentose scales: acorn (immature) short and scarcely emergent.

Western Sierra Madre region of Mexico.

Specimens examined.—Without precise locality (*Seemann, 1967*, the type); Colima (*Kerber, 206, 208*); Sta. Clara, Michoacan (*?Endlich, 1385*); Tepic (*?Gregg, 989*, with staminate catkins 30 mm. long, closely flowered, the hairy anthers exserted); Guadalajara, Zappan, and Lake Chapala (*Galeotti, 119*).

A discussion of the possible applicability of Scheidweiler's prior name *Q. xylina* to this species is to be found above (p. 60), under *Q. Martensiana*.

LAETAE.—Moderate-sized trees with slender tomentose twigs, rounded buds, usually deciduous stipules, typically elliptical repand or crenately toothed rather short-petioled leaves reticulately impressed above and loosely tomentulose beneath, and annual rather small filiform-stalked fruit with close acute tomentose scales.—Western Sierra Madre region of Mexico.

Leaves uniformly broad; petioles rather stout.....*Q. laeta.*
Some leaves linear; petioles slender.....f. *heterophylla.*

QUERCUS LAETA Liebmann.

Plates 86 and 87.

Quercus laeta Leibmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 179.—Liebmann-Oersted, Chênes Amér. Trop., p. 24, pl. 37.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 29.
Q. pandurata laeta Wenzig, Jahrb. K. Bot. Gart. Berlin, vol. 3, p. 197, 1884.

Twigs rather slender (2–3 mm.), fluted, somewhat scurfy, or glabrescent with small pale lenticels. Buds brown, glabrescent, round-ovoid, 2×3 mm. Leaves deciduous, lanceolate or elliptical-oblong, obtuse, rounded at base, entire or crenately toothed, rather small (2–3×7–8

cm.), glossy and glabrous above except for the puberulent or scurfy midrib, short-tomentose beneath; veins about 12×2, obscurely looped; petiole pubescent, scarcely 5 mm. long. Catkins ?. Fruit annual, scattered on a scurfy peduncle 1–1.5×70 mm.; cup deep-saucer-shaped, rather small (12 mm. in diameter), with thin appressed rather acute canescent scales; acorn ovoid, 12 mm. long, scarcely one-third included.

Cordilleran region of Mexico.

Specimens examined.—Grande (*Hartweg, 419*, the type).

An interesting form—comparable with those occasionally occurring in other white oaks—with leaves varying from the typical size and shape to narrowly linear-spatulate, even on the same branch, occurs in the herbarium of the Muséum at Paris (*Bourgeau*, without number), and may be known as f. **heterophylla**.

OBSCURAE.—Small trees ?, with slender glabrate twigs, round-ovoid buds, somewhat persistent stipules, moderately small lanceolate or oblong entire or crenate impressed-reticulate short-petioled leaves sparsely scurfy beneath, and annual rather small short-stalked fruit with rather blunt thin tomentose scales.—Western Sierra Madre region of Mexico.

Leaves whitened beneath, scarcely revolute.
  Leaves relatively large, subacute.....*Q. obscura.*
  Leaves small, very obtuse.....v. *perpusilla.*
Leaves not whitened, somewhat revolute; shrubby.
  Elliptical-oblong.....*Q. transmontana.*
  Elliptical.....v. *lata.*

Quercus obscura n. sp.

Plates 88 and 89.

Twigs rather slender (2–3 mm.), little fluted, from hairy glabrescent, buff or darkening with small pale lenticels. Buds rather glossy brown, glabrous, round-ovoid, 2×3 mm., the upper with persistent setaceous stipules. Leaves deciduous ?, narrowly lanceolate, rather acute, rounded at base, nearly entire to coarsely low-serrate above, small (1.5–2×7–8 cm.), glossy and glabrous above or with the midrib scurfy, shortly stellate-velvety and whitened beneath; veins about 12×2, obscurely looped; petiole glabrate, scarcely 5 mm. long. Flowers and fruit ?.

Western Sierra Madre region of Mexico.

Specimens examined.—Without precise locality (*Seemann, 1971*, the type, occurring in Liebmann's herbarium as also in the Hooker and Gray herbaria as *Q. laeta*, the type of which, however, is clearly very different; *Hartweg 419*).

With smaller elliptical-oblong mucronately obtuse round-based leaves similarly whitened beneath and dotted, not over 1.5×5 cm., and annual paired fruit on a hairy stalk scarcely 10 mm. long, with small half-round cup 10 mm. in diameter with thin appressed acute canescent scales and round-ovoid half-included acorn, it is var. **perpusilla**.

Western Sierra Madre (*Seemann, 1976*—seen at Kew and in the Gray herbarium).

Quercus transmontana n. sp.

Plate 89.

Twigs rather slender (2–3 mm.), fluted, rather scurfy through the first season, glabrescent and glossy brownish with rather small prominent lenticels of the same color. Buds ?, the setaceous stipules persistent. Leaves deciduous, elliptical-oblong or widened upwards, very obtuse, rounded at base, entire or somewhat crenately lobed above, narrowly revolute, small (2×4 to mostly 6–9 cm.), glossy and glabrous or very slightly scurfy above, dull, pale and for a time loosely stellate-scurfy beneath, the denuded surface scarcely granular; veins reddish, about 10×2, often with evanescent intermediates, rather indistinctly looped; petiole somewhat pilose, 1.5×3 mm. Catkins ?. Fruit annual, few toward or at the end of a stalk 10–20 mm. long; cup shallow-cup-shaped, rather small (10–15 mm. in diameter), with thin appressed rather blunt scales brown by abrasion; acorn round-ovoid, scarcely 15 mm. long, fully half-included.

Western Sierra Madre region of Mexico.—A very low tufted shrub.

Specimens examined.—Patzcuaro, Michoacan (*Pringle*, 4116, July 18, 1892, the type); Loma Sta. Maria, Morelia, Michoacan (*Arsène*, *2942*, *5927*).

What appears to be a form of this species, with shorter and broader leaves, from Loma Sta. Maria (*Arsène*, 1909, in the Munich herbarium; *2975*, *3488*), may be known as var. **lata**.

RETICULATAE.—Medium-sized trees, or exceptionally shrubs, with moderate usually tomentose twigs, ovoid buds with persistent stipules, rather large prevailingly obovate repandly or crenately mostly pungent short-petioled leaves glabrate and impressed-reticulate above and scurfy or tomentose beneath with the veiny denuded surface usually granular, and annual usually long-stalked moderate fruit with little thickened tomentose pointed scales.—Mexican table-land and adjacent mountains.

Leaves with a very dense detachable fleece beneath.....*Q. vellifera.*
Leaves tomentose or mostly stellate-scurfy (exceptionally glabrescent) beneath.
Moderate (scarcely 10 cm. long); peduncles not over 8 cm. long.
Nearly glabrescent, the larger coarsely dentate.....*Q. durangensis.*
Persistently scurfy or velvety-pubescent, as a rule.
Lower surface usually yellow and granular.
Leaves relatively large (some 4×5 cm.).
Loosely hairy.....*Q. diversicolor.*
Glabrescent and green.....v. *socorronis.*
Leaves very small (scarcely 2×4 cm.).....v. *Mearnsii.*
Lower surface dingy or gray, often whitening.
Leaves subelliptical, nearly entire or low-undulate, exceptionally incised.
Cup rather small (12 mm.); leaves red-veined.
Acorns elongated.
Leaves rather flat.....*Q. rhodophlebia.*
Leaves concave beneath.....f. *concava.*
Acorns short.
Peduncle long.....f. *applanata.*
Peduncle very short.
Leaves merely crenate.....f. *apus.*
Leaves sometimes incised.....f. *incisa.*
Cup rather large (18 mm.).....*Q. ariaefolia.*
Leaves subelliptical, crenate.....*Q. rhodophlebia crenata.*
Leaves obovate, more or less pungently toothed.
Scarcely cordate or crenate.
Cup-scales thin.
Acorns scarcely twice as long as the cup.
Leaves merely repand-dentate.....*Q. reticulata.*
Leaves coarsely toothed.....f. *Dugesi.*
Acorns elongated.
Cup-scales appressed.....f. *longa.*
Cup-scales loose.....f. *squarrosa.*
Cup-scales somewhat thickened and broad.....*Q. Uhdeana.*
Cordate, crenately low-toothed.....*Q. rugosa.*
Low-crenate, scarcely pungent.
Peduncles rather long. (6 cm.).....*Q. Bonplandiana.*
Peduncles short (3–4 cm.).....*Q. alvarezensis.*
Large (10–15 cm. long); or peduncles over 7 cm. long.
Obovate.
Fruit rather large (25 mm. in diameter).....*Q. Purpusi.*
Fruit moderate; peduncles very long.
Leaves rather moderate; peduncle 10 cm.....*Q. conglomerata.*
Leaves large; peduncle as much as 25 cm.....*Q. decipiens.*
Elliptical-obovate.....*Q. rhodophlebia.*
Elliptical to obovate-oblong.....*Q. innuncupata.*

Quercus vellifera n. sp.

Plate 90.

Twigs rather stout (4–5 mm.), fluted, detachably long-stellate-fleecy. Buds ?. Leaves deciduous ?, elliptical-obovate, obtuse, cordate, coarsely dentate-lobed, crisped, rather large (6–7×7–12 cm.), puberulent or glabrescent and glossy above, the whitened lower face covered by a detachable yellowish fleece of matted stellate hairs; veins about 10×2, often forked but scarcely looping; petiole tomentose, 2×2–3 mm., often with persistent stipules. Flowers and fruit ?.

Western Sierra Madre region of Mexico.

Specimens examined.—"Western Mexico" (*Palmer*, October, 1891, the type in the U. S. National herbarium, as sheet no. *305157*).

Quercus durangensis n. sp.

Plate 91.

Twigs rather stout (3–5 mm.), fluted, stellate-pilose through the first season, then dull light brown with rather inconspicuous lenticels. Buds dull light brown, from hairy glabrescent, ovoid, 2×3 mm., the upper with investing stipules. Leaves deciduous, obovate, very obtuse, shallowly cordate, often dentate from below the middle, rather large (7–9×8–12 cm.), the slightly convex impressed-veiny upper surface glossy and glabrescent or with puberulent midrib, the prominently veiny lower surface glabrate and granular-bullate; veins about 8–10×2, somewhat forking but scarcely looped; petiole glabrate, 2×4 mm. Catkins ?. Fruit annual, several at end of a loosely stellate or glabrate peduncle about 1×40 mm.; cup half-round, small (10 mm. in diameter), with thin somewhat loose acuminate brown-tipped scales dingy tomentose below; acorn ovoid, 10 mm. long, about one-third included.

Western Sierra Madre region of Mexico.

Specimens examined.—Durango (*Matthews*, Nov., 1904, the type, in the herbarium of the Missouri Botanical Garden); La Providencia, Durango, at 2,100–2,700 m. (*Nelson, 5002*, from which the fruit is described).

Quercus diversicolor n. sp.

Plates 92 to 94.

Quercus reticulata Engelmann, Trans. Acad. St. Louis, vol. 3, p. 383, etc., 1876.—Greene, Ill. W. Amer. Oaks, pl. 16.—Sargent, Silva, vol. 8, pl. 390; Manual, f. 230.—Britton & Shafer, N. A. Trees, f. 269.—Rydberg, Bull. N. Y. Bot. Gard., vol. 2, p. 223, pl. 31: all as to the United States only. Not *Q. reticulata* Humboldt & Bonpland, Plant. Aequinoct., vol. 2, p. 40, pl. 86, 1809, for which see p. 75, below.

Twigs rather slender (2–3 mm.), fluted, from stellate-pilose glabrescent, rather glossy brown with inconspicuous small lenticels. Buds rather dull light brown, glabrescent, ovoid, 1.5×2 mm., the terminal with persistent stipules. Leaves deciduous ?, round-obovate, very obtuse, shallowly cordate, low-dentate above, rather small (3–4×4–6 cm.), the convex upper surface slightly glossy green and at most sparingly stellate-tufted, with impressed veins, the lower surface dull, prominently veined, loosely hairy and brownish-yellow granular; veins about 8×2, somewhat forking but hardly looped; petiole stellate-hairy, about 1×5 mm. Catkins: ♂, about 50 mm. long, rather loosely flowered, fleecy, the smooth rounded anthers little exserted. Fruit annual, usually 2 or 3 at end of a slightly hairy peduncle about 2×10–15 mm.; cup half-round, rather small (10–15 mm. in diameter), with thin closely appressed acute brown scales somewhat rusty or canescent below; acorn ovoid, about 10 mm. long, nearly half-included.

Western Sierra Madre region, chiefly in the United States.—Said to occur in New Mexico as a shrub only. The net-leaf oak.

Mexican specimens examined.—Sierra Madre, Chihuahua, at 2,600 m. (*Pringle, 2021*, Oct. 9, 1888, the type); without data (*Pringle*, 1887).

Closely allied to if not actually forms, as they now appear to be, of this species are the several intergrading oaks of southern Arizona that have been referred to *Q. reticulata* of the southern Mexican table-land, and to which the illustrations cited refer: Mt. Graham (*Lemmon*, 1880); Huachuca Mts. (*Lemmon*, 1882); Chiricahua Mts. (*Toumey*, 1894, 1896; *Blumer, 1294, 1309, 1921, 1960, 3467*); Sta. Rita Mts. (*Engelmann & Sargent*, Sept. 27, 1880; *Pringle* 1881, 1884); Sta. Catalina Mts. (*Toumey*, 1896). Of the same series is an oak of the Mogollon Mts. of New Mexico (*Metcalfe, 669*, Sept. 8, 1903), with the heavier leaves 5×10 cm. green and glabrous beneath, var. **socorronis**, and a small-leaved Boundary region form (S. Luis Mountains, *Mearns, 2230*), var. **Mearnsii**.

Quercus rhodophlebia n. sp.

Plates 95 to 97.

Twigs rather slender (2–3 mm.), scarcely fluted, rusty stellate-tomentose, reddish, turning gray when denuded and with numerous prominent lenticels. Buds densely yellow-tomentose, glossy red when abraded, round-ovoid, 2×3 mm., the upper with a few short investing stipules. Leaves deciduous, elliptical-obovate, very obtuse, truncate at base or shallowly cordate, undulate and unequally revolute with some of the upper veins mucronate, moderate (4–6×8–11 cm.), glossy, glabrous above except for the somewhat stellate midrib and impressed-reticulate with slightly raised thick veinlets, dull and loosely rusty-stellate beneath, the abraded surface pale and little bullate, the glabrescent midrib and primary veins pink; veins about 10×2, or with some evanescent intermediates, branched and rather evidently looped; petiole rusty-stellate, 10 mm. long. Catkins ?. Fruit annual, several toward the end of a sparsely stellate peduncle 1×90–100 mm.; cup half-round or somewhat acute-based, moderate (15 mm. in diameter), with thin or slightly keeled rather close red-brown scales somewhat rusty-puberulent below; acorn elongated, 10×20 mm., one-third included.

Western Sierra Madre region of Mexico.

Specimens examined.—Plateado, Zacatecas (*Rose, 2806*, Sept. 4, 1897, the type in the U. S. National herbarium, as sheet no. *301740*).

A close ally of *Q. reticulata* and, like the preceding species, equally polymorphic: With obovate or slightly pandurate often revolutely very concave leaves, f. **concava** (Bolaños, Jalisco, *Rose 2998*, Sept. 15–17, 1897); with deeply crenate leaves, f. **crenata** (Morelia, Michoacan (*Arsène, 6018, 5373*); with flat crenate-dentate leaves, and fruit one-third smaller on peduncles half as long, f. **applanata** (Plateado, Zacatecas, *Rose, 2735*, Sept. 1, 1897); with short nearly included acorns, f. **inclusa** (Bolaños, Jalisco, *Rose, 3726*, Sept. 17, 1987); with entire to crenate stellate-tussocky leaves and subsessile flattened cups narrowed in over the depressed included acorns, f. **apus** (Plateado, Jalisco, *Rose, 2721*, Sept. 1, 1897).

Quercus ariaefolia n. sp.

Plate 97.

Twigs rather stout (3 mm.), fluted, from tomentose glabrescent and buff with inconspicuous small lenticels. Buds dull brown, glabrate, ovoid, some 2×3 mm. Leaves deciduous, elliptical or slightly widened upwards, very obtuse, entire or very slightly repand or exceptionally somewhat crenate-serrate near the end, rounded or slightly acute at base, slightly revolute, rather large (4–6×9–10 cm.), detachably dingy-tomentose beneath, the denuded surface granular-bullate; veins about 10×2, a little branched but hardly looping; petiole tomentulose or glabrescent, about 10 mm. long. Catkins ?. Fruit annual, paired near the end of a tomentose or glabrescent stalk (2×30 mm., or with an extra whorl when this is elongated to 60 mm.; cup rather shallow and large (18–20 mm. in diameter), with slightly keeled loose acute tomentulose scales: acorn ?.

Mexican table-land.

Specimens examined.—Alvarez, S. L. Potosi (*Palmer, 82*, Sept., 1902, the type).

QUERCUS RETICULATA Humboldt and Bonplanc

Plates 98 and 99.

Quercus reticulata Humboldt & Bonpland, Plant. Aequinoct., vol. 2, p. 40, pl. 86, 1809.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 34.

Twigs moderate (3 mm.), little fluted, from rather villously dingy-tomentose becoming subglabrous and buff or gray with small inconspicuous lenticels. Buds brown, glabrescent, ovoid, 2×3 mm., for a time with investing hairy stipules. Leaves deciduous, obovate, very obtuse, repandly callous-denticulate above, narrowed to the rounded or shallow-cordate base, rather small (3–4×6–7 cm.), flat, at length somewhat glossy and glabrate above except for the scurfy midrib, stellate to densely brown-tomentose beneath, the denuded surface somewhat granular; veins about 8–10×2, somewhat branched but hardly looped; petiole dingy-fleecy, about 5 mm. long. Catkins: ♂, 50 mm. long, at first very stellate-hairy, rather closely flowered, the rounded glabrous anthers not exserted. Fruit annual, usually 2 or 3 at end of a loosely hairy peduncle 2×30–60 mm.; cup half-round, moderate (15 mm. in diameter), with somewhat lightly keeled typically appressed acute canescent scales; acorn ovoid, typically half-included.

Mexican table-land.—A moderately large tree.

Specimens examined.—Sta. Rosa to Guanajuato (*Bonpland, 4408*, the type; *Dugès, iv, 2.*); Tulancingo (*Nelson, 2*, 1893); Queretaro (*Schiede*); Zacualtipan (*Paul, Duke of Wuertemberg*, 1830); without locality (*Schiede; Deppe*); cultivated at Hyères (*Barbey*, 1888) and Kew (*Nicholson, 3154*).

With coarsely toothed foliage, from the type region, it is f. **Dugesi** (*Dugès, 3*). Two other minor forms may be distinguished: f. **longa**, with acorns 15 mm. long and one-third included in the cup, from about Real del Monte (*Ehrenberg, 879, 897–8, 921–2*); and f. **squarrosa**, differing from this in having very loose scales, and occurring in the same region (*Ehrenberg, 903–6, 908*) as well as without indicated locality (*Graham, 325, 328*).

Quercus Uhdeana n. sp.

Plate 100.

Twigs rather stout (3–5 mm.), deeply fluted, soon glabrescent and glossy buff with small prominent lenticels of the same color. Buds hairy or tardily glabrescent, elongated-ovoid, 2×3 mm. or longer, with persistent stipules. Leaves partly evergreen, obovate, very obtuse, shallowly cordate or low-dentate or serrate, especially upwards, moderate (4–5×6–7 cm.), somewhat glossy above and glabrous or with scurfy midrib, from shortly dingy-stellate glabrescent and bullate-granular beneath; veins about 8×2, with frequent short intermediates, branched and running into the teeth or short marginal mucros but hardly looped; petiole glabrescent, 2×5 mm. Catkins?. Fruit annual, on a stout peduncle 3×30 mm.; cup (immature) rounded, moderate (15 mm. in diameter), with thick appressed blunt-pointed dingy-tomentose scales blackish where abraded; acorn?.

Mexican table-land?.

Specimens examined.—Without locality, but perhaps in the Real del Monte district (*Uhde, 276*, the type, in the Berlin herbarium); Teoxomulco (*? Karwinski*).

QUERCUS RUGOSA Née.

Plates 101 and 102.

Quercus rugosa Née, Anal. Cienc. Nat., vol. 3, p. 275, 1801.
Q. spicata Humboldt & Bonpland, Plant. Aequinoct., vol. 2, p. 46, pl. 89, 1809.
Q. macrophylla rugosa Wenzig, Jahrb. K. Bot. Gart. Berlin, vol. 3, p. 198, 1884.

Twigs rather stout (3–4 mm.), little fluted, more or less persistently tomentose. Buds rather pubescent, ovoid, some 3×4 mm. Leaves deciduous, elliptical-obovate, obtuse, cordate, callous-crenate-serrate above, moderate (3–5×8–10 cm.), rather glossy and glabrate above, dingy-tomentose beneath; veins about 8×2, at most obscurely looping; petiole tomentose,

about 10 mm. long. Catkins ?. Fruit annual, several toward the end of a more or less glabrate peduncle some 2×70–80 mm.; cup shallow, rather small (12 mm. in diameter), with thin rather close acute tomentulose scales; acorn ?.

Mexican table-land, the type from about Huisquiluca and Ocuila.

Specimens examined.—Cerro de las Navajas, near Moran (*Bonpland, 4061*, the type of *Q. spicata; Endlich, 1011*); Sta. Rosa to Desierto (*Endlich, 376a, 377*); Desierto (*?Uhde, 272–3, 275, 292, 306*); without locality (*?Uhde, 266, 268, 274, 297–8; Hahn; Pavon*, probably a cotype collected by Née himself; *Schmitz*).

QUERCUS BONPLANDIANA Sweet.

Plate 103.

Quercus Bonplandiana Sweet, Hort. Brit., p. 370, 1826.

Q. ambigua Humboldt & Bonpland, Plant. Aequinoct., vol. 2, p. 51, pl. 93, 1809—not Michaux, f., Hist. Arb. Amér., vol. 2, p. 120, pl. 24, 1801.

Twigs rather slender (2–3 mm.), little fluted, glabrescent, with evident small lenticels. Buds brown, glabrate, ovoid, 2×3 mm. or more. Leaves deciduous, narrowly obovate, very obtuse, rounded at base, low-crenate, moderate (about 4×8–10 cm.), at most sparingly and finely pubescent beneath; veins about 7–8×2, at most obscurely looped; petiole glabrescent, 5–10 or 15 mm. long. Catkins: ♂, about 40 mm. long, fleecy, closely flowered, the rounded glabrous anthers scarcely exserted. Fruit annual, toward the end of a peduncle some 60 mm. long; cup and acorn ?.

Mexican table-land.

Specimens examined.—Moran (*Bonpland*, the type); Real del Monte (*?Ehrenberg, 899, 900, 901, 909. 910*, and *586* in part); without locality (*Schmitz*).

Quercus alvarezensis n. sp.

Plate 104.

Twigs rather stout (3–4 mm.), somewhat fluted, more or less persistently tomentose, becoming brown with small rather inconspicuous lenticels. Buds rather glossy red-brown, glabrescent or the outer scales hairy, ovoid, some 2×3 mm. Leaves deciduous, obovate, very obtuse, somewhat cordate, openly crenate, flat, moderate (4–5.5×8–9 cm.), stellate-tufted with tawny puberulence beneath, little granular when denuded; veins about 8×2, scarcely looping; petiole scurfy or glabrescent, 5 mm. long. Catkins ?. Fruit annual, somewhat clustered, on rather stout more or less scurfy peduncles 30 or 40 mm. long; cup half-round, moderate (12–15 mm. in diameter), with rather thick appressed very tomentose acute scales; acorn rounded, nearly included.

Mexican table-land.

Specimens examined.—Alvarez, S. L. Potosi (*Palmer, 69*, Sept., 1902, the type).

Quercus Purpusi n. sp.

Plate 105.

Twigs moderate (3–4 mm.), somewhat fluted, from tomentose glabrescent, gray-buff with rather prominent small lenticels. Buds brown, glabrescent, round-ovoid, 2×3 mm. Leaves deciduous, obovate, very obtuse, convallately cordate often with closed sinus, undulate to somewhat crenate or serrate above with mucronate veins, rather large (3–8×10–13 cm.), somewhat glossy and glabrous or with granular midrib above, dull, yellow, and somewhat scurfy beneath, the denuded surface low-bullate-granular; veins about 10–12×2, somewhat branching but obscurely looped; petiole more or less tomentose, 2–3×5 mm. Catkins ?. Fruit annual, solitary on glabrescent peduncles 2–3×25–90 mm.; cup half-round, large (25 mm. in diameter), with thick-based appressed acute canescent scales; acorn oblong, half-included.

Mexican cordillera and adjacent Western Sierra Madre.

Specimens examined.—Salto de Agua, Mexico (*Purpus, 1794*, Nov., 1905, the type); Cerro Azul, Morelia, Michoacan (*?Arsène*, 1911); El Oro (*?Rangel, 2935 bis*).

Quercus conglomerata n. sp.

Plate 106.

Twigs rather stout (3–4 mm.), somewhat fluted, glabrate. Buds brown, glabrescent, ovoid, some 2×3 mm. Leaves deciduous, obovate, very obtuse, rounded at base or somewhat cordate, entire or repand or somewhat toothed, mostly concave below, rather large (6×10 cm. or more), glabrate above, more or less persistently stellate-pubescent beneath; veins about 10–12×2, branched but at most irregularly looping; petiole somewhat pubescent, 10–20 mm. long. Catkins ?. Fruit annual, distributed along peduncles as much as 100 mm. long; cup half-round, moderate (12–15 mm. in diameter), with rather thin and loose puberulent acute scales; acorn rounded, half-included or less.

Cordilleran and Western Sierra Madre regions of Mexico.—An aggregate of forms variously intermediate between *Q. reticulata squarrosa*, *Q. centralis*, *Q. laeta*, and *Q. decipiens*.

Specimens examined.—Tlalpuxahua (*Hartweg, 429*, the type); Contreras (*Endlich, 643*); Sierra de Ajusco (*Pringle, 13610; Lemmon, D, 104*); Angel (*Bourgeau, 271–2*); Monte Zuma (*Bourgeau, 1141, 1142; Hahn, 1141*); S. Nicolas, etc. (*Bourgeau, 1005–6, 1008, 1012, 1133–5*); Cañada Grande (*Ross, 176, 184*); foothills of Istaccihuatl (*Deam, 125*); S. Andres Chalchicomula (*Ross, 1254; Stone, 139*); Boca del Monte (*?Schenck, 95*); without precise locality (*Schmitz, 184*); Yavesia (*Liebmann, 201*); Cuesta de S. Juan del Estado (*Liebmann, 153, 216, 3546–7*); Salto de Agua (*Purpus, 1795*); Cerro Azul, Morelia, Michoacan (*Arsène, 5525*).

Quercus decipiens Martens and Galeotti.

Plates 106 and 107.

Quercus decipiens Martens & Galeotti, Bull. Acad. Brux., vol. 10, part 1, p. 214, 1843.
Quercus spicata Liebmann-Oersted, Chênes Amér. Trop., pl. H, 35, 1868—not Humboldt & Bonpland, Plant. Aequin., vol. 2, p. 46, pl. 89, 1809.

Twigs rather stout (4–5 mm.), little fluted, glabrescent, reddish with small pale lenticels. Buds brown, rusty-hairy, ovoid, 3×4 mm. or more, for a time with hairy stipules. Leaves deciduous, obovate, very obtuse, repand or low-toothed above, somewhat narrowed to the cordate base, large (12–16×18–25 cm.), nearly glabrous above, the concave lower face more or less puberulent and typically whitened; veins about 10×2, somewhat branched but hardly looped; petiole rather fleecy, scarcely 10 mm. long. Catkins ?. Fruit annual, more or less verticillately distributed along a tomentose or glabrate peduncle as much as 250 mm. long; cup half-round, moderate (15 mm. in diameter), with thin rather loose hairy gray scales; acorn ellipsoid, 12×20 mm., scarcely one-third included.

Eastern Sierra Madre region of Mexico.—A tree 20–25 m. high.

Specimens examined.—Mirador (*Galeotti, 131*, the type); Pico de Orizaba (*Liebmann, 3545; Seaton, 232*); Esperanza (*Arsène, 7100*); without locality (*Rathsack*); Xuchil, V. C. (*Heller & Barber, 5*).

The possibility is not excluded that Scheidweiler may have intended this collection of Galeotti when applying his name *Q. xylina*—discussed above under *Q. Martensiana* (p. 60).

Quercus innuncupata s. sp.

Plate 108.

Twigs moderate (3–4 mm.), little fluted, glabrescent, light brown with rather prominent concolorous lenticels. Buds brown, glabrescent and glossy or with ciliate scales, ovoid, 3×5 mm. Leaves deciduous, broadly elliptical to variously obovate or oblong-obovate, very obtuse, cordate, entire or undulate or deeply repand, large (becoming 10–12×18 cm.), glabrate and rather glossy above, from stellate-woolly glabrescent with granular-bullate surface beneath; veins about 12×2, somewhat looping; petiole glabrescent, scarcely 10 mm. long. Flowers ?. Fruit annual, crowded toward the end of a scurfy or glabrescent peduncle as much as 3×50–70 mm.; cup nearly half-round, rather large (20 mm. in diameter), with more or less keeled or

thick-based appressed dingy brownish scales; acorn (representative?) subglobose, about 15 mm. in diameter, half-included.

Western Sierra Madre region of Mexico.

Specimens examined.—Loma Sta. Maria, Michoacan (*Arsène, 5826,* the type); Campanario, Michoacan (*Arsène, 6682*); Cerro S. Miguel, Michoacan (*Arsène,* 1910, *5312, 5556,* at 2,200 m.).

REVOLUTAE.—Small or moderately large, with moderate for a time tomentose twigs, ovoid buds, short if persistent stipules, rather small mostly elliptical entire or toothed revolute leaves glabrous and impressed-reticulate above and mostly rusty-tomentose with the usually veiny denuded surface more or less granular beneath, and annual short-stalked fruit with thin usually canescent scales.—Eastern Sierra Madre and Cordillera of Mexico.

Leaves entire or low-repand.
Relatively broad, sparingly tomentose beneath.....*Q. Greggii.*
Rather elongated, loosely tomentose beneath.....*Q. aculcingensis.*
Leaves often rather sharply toothed above.
Elliptical, evergreen: twigs glabrescent.
Leaves entire or dentate.....*Q. revoluta.*
Leaves serrate.....f. *dysophyllopsis.*
Rather obovate, deciduous: twigs tomentose.....*Q. Loeseneri.*

Quercus Greggii n. comb.

Plate 109.

Quercus reticulata Greggii A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 34, 1864.

Twigs moderately stout (3 mm.), little fluted, rusty stellate-tomentose becoming glabrous and gray with prominent small lenticels the second year. Buds hairy, round-ovoid, 2 mm. in diameter. Leaves evergreen, elliptical-obovate, mucronately very obtuse, cordate, entire or slightly repand above, somewhat revolute, rather small (3–5×4–7 cm.), papillate and glabrate except for the granular or puberulent midrib above, rusty stellate-floccose beneath, the denudable surface bullate-granular; veins about 6–8×2, repeatedly branching and mostly looped at some distance from the margin; petiole tomentose or glabrate, 2×5–10 mm. Catkins?. Fruit apparently annual, nearly sessile, moderate, the cup with thin appressed acute brown-hairy scales; acorn somewhat conical, 20 mm. long, apparently covered only at the base.

Eastern Sierra Madre region of Mexico.—A tree 10–12 m. high, called encino.

Specimens examined.—San Antonio, near Saltillo, Coahuila (*Gregg, 380,* Aug. 31, 1848, the type).

Quercus aculcingensis n. nom.

Plate 110.

Quercus reticulata crassifolia Oersted in Liebmann-Oersted, Chênes Amér. Trop., p. 29, pl. 34, 1869.

Twigs moderately stout (3 mm.), scarcely fluted, dingy-fleecy, in the second season with prominent lenticels. Buds glossy brown, glabrate, round-ovoid, 2–3 mm. in diameter. Leaves deciduous, elliptical, obtuse or subacute, rounded at base, entire, undulately very revolute, small (2–2.5×4 cm.), somewhat glossy and glabrous above except for the granular midrib, densely dingily long-tomentose beneath; veins about 8–10×2, looped, like their branches deeply impressed above; petiole woolly, 2×5 mm. Flowers and fruit?.

Cordilleran region of Mexico.

Specimens examined.—Puente Colorado, Cuesta de Aculcingo (*Liebmann, 151–2, 154–5, 3473, 3548–9,* the types).

Quercus revoluta n. sp.

Plates 111 and 112.

Twigs slender (2 mm.), somewhat fluted, glabrescent, grayish red. Buds brown and glossy. Leaves evergreen, elliptical, rounded at both ends, entire, very revolute, small (2–3×5–6 cm.), glossy and glabrous above except for the sometimes granular midrib, densely rusty-tomentose beneath; veins about 8×2, rather equally branched, looping; petiole glabrescent,

1.5×5 mm. Catkins: ♂, 30 mm. long, densely canescent, rather loosely flowered, the glabrous rounded anthers long-exserted. Fruit annual?, paired at end of a glabrate peduncle 2×20 mm.; cup half-round, rather large (15–20 mm. in diameter), with thin appressed acute red scales somewhat canescent below; acorn ovoid, 20 mm. long, silvery-scurfy at top, fully half-included.

Cordilleran region of Mexico.—A dwarf species scarcely 1 m. high, some shoots of which bear crenately dentate fulvous-tomentose leaves very different from those of the usual form.

Specimens examined.—Honey Station, Puebla, at 1,900 m. (*Pringle, 8966*, April 25, 1904, the type); S. Martin, Puebla (?*Nelson*, 1893).

A sharply serrate sterile specimen (*Berlandier, 411*), in the Candollean herbarium, may be known as f. **dysophyllopsis.**

Quercus Loeseneri n. sp.

Plate 110.

Twigs rather slender (2–3 mm.), little fluted, glabrescent from loosely stellate-fleecy, rather glossy salmon-colored changing to gray. Buds?. Leaves deciduous, broadly elliptical or somewhat obovate, obtuse, shallowly cordate, rather acutely several-toothed above and more or less repand below, slightly revolute, small (2–2.5×3–4 cm.), glossy and glabrescent above though papillate-roughened, persistently coarsely pale fuscous-tomentose beneath; veins about 8–10 ×2, forking and looped; petiole tomentose, 2×3 mm. Catkins?. Fruit annual?, solitary or paired at end of a tomentose peduncle 2×10 mm.; cup half-round, rather small (10–12 mm. in diameter), with thin appressed or somewhat loose acute canescent scales; acorn ovoid, 15 mm. long, scarcely half-included.

Eastern Sierra Madre region of Mexico.—A low species, scarcely 2 m. high.

Specimens examined.—Mountains near Saltillo, Coahuila, at 2,300 m. (*Pringle, 10120*, the type, Nov. 6, 1905).

DESERTICOLAE.—Shrubs or small trees with rather slender yellow-tomentose twigs, rounded buds with persistent setaceous stipules, rather small narrowly revolute leaves mostly serrately few-toothed above, with more or less scurfy or villous upper face and pilose lower face, and apparently annual fruit on peduncles as much as 5 cm. long.—Mexican table land and adjacent Cordillera.

Leaves at most crenate-dentate.....*Q. diversifolia.*
Toothing serrate.
  Leaves slightly impressed-reticulate.
    Oblong, short, entire below.....*Q. deserticola.*
    Oblanceolate, elongated, coarse-toothed.....v. *incisa.*
  Leaves alveolate, with raised veinlets.....*Q. alveolata.*

QUERCUS DIVERSIFOLIA Née.

Quercus diversifolia Née, Anal. Cienc. Nat., vol. 3, p. 270, 1801.
Q. tomentosa diversifolia A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 33, 1864.

"Quercus foliis ovatis subtus tomentosis, integris aut dentatis: fructibus racemosis." Leaves oblong or elliptical, crenate-dentate to subentire on the same branch, rather small (1.2–2.5×2.5–7 cm.), tomentose beneath. Peduncle 50 mm. long.

Mexican table-land, the type from between Chalma and Sta. Rosa.—A shrub 3–5 m. high.

A problematic species, apparently of this alliance rather than of the Pedunculares.

Quercus deserticola n. sp.

Plates 113 and 114.

Twigs rather slender (2–3 mm.), little fluted, densely coated with staring yellow tomentum persisting the second year. Buds brown or persistently hoary, round-ovoid, 2 mm. in diameter. Leaves partly evergreen, elliptical varying into oblong, lanceolate or subovate, rather acute, rounded or slightly cordate at base, usually sharply serrate above, becoming strongly revolute,

rather small (1.5×3 or 3–3.5×7–9 cm.), golden-scurfy or stellate-villous above, or denuded and glossy, dull and loosely clothed with dingier removable hairs beneath; veins about 7–9×2, not regularly looped; petiole tomentose, scarcely 2×5 mm., with rather persistent stipules. Catkins: ♂, scarcely 15 mm. long, floccose, compactly flowered, the round somewhat fleecy anthers little exserted; ♀, as much as 40 mm. long, yellow-tomentose, few-flowered at the end. Fruit ?.

Mexican table-land.

Specimens examined.—Desierto (*Uhde, 38, 309*, the type, *47, 49, 305, 307, 308*, in the Berlin herbarium); Hacienda Cierro, Querétaro (*?Rose, Painter & Rose, 9664*,—with the acorns paired at end of a very short stalk); without data (*?Bourgeau*, 1865–6); Ixmiquilpan (*Purpus, 1233*).

Associated with the type collections is a specimen (*Uhde, 265*) with elliptical-oblanceolate coarsely serrate leaves 3.5×7–9 cm., which may be distinguished as var. **incisa.**

Quercus alveolata n. sp.

Plate 114.

Twigs moderate (3 mm.), scarcely fluted, tomentose with long yellow hairs somewhat persistent the second year, the bark then gray with small somewhat raised brownish lenticels. Buds brown, glabrate, ovoid, 2×3 mm. Leaves deciduous, elliptical or somewhat widened upwards, subacute, round-based, revolutely undulate to coarsely serrate above, moderate (2–4×5–9 cm.), rather dull blue-green and glabrous except for the yellow hairy midrib and with very fine alveolate white venulation above, dingy stellate-pilose beneath; veins about 8×2, obscurely looped near the margin; petiole yellow-hairy or glabrate, scarcely 2×4 mm. Catkins: ♂, apparently short, the small rounded glabrous anthers little exserted. Fruit ?.

Cordilleran region of Mexico.

Specimens examined.—Cerro del Gavilan, Puebla (*Purpus, 4091*, Aug. 1909, the type).

LECOMTEANAE.—Shrubs or small trees with rather slender tomentose or glabrescent twigs, ovoid buds with persistent setaceous stipules, rather small elliptical or oblong entire to crenate or crenately somewhat lobed revolute somewhat impressed-veiny short-petioled leaves often puberulent above and densely short-tomentose beneath, and annual short-stalked moderately small fruit with scarcely thickened tomentose scales.—Mexican table-land and adjacent Cordillera.

Leaves elliptical, nearly entire.
- Slightly cordate.....*Q. manzanillana.*
- Not cordate.....*Q. Lecomteana.*

Leaves ovate to obovate or oblanceolate.
- Persistently short-tomentose.....*Q. vallicola.*
- Glabrate.
  - Short, often entire.....*Q. texcocana.*
  - Elongated, crenate.....v. *ampla.*

Leaves oblong, entire or few-lobed above.....*Q. subtriloba.*

Quercus manzanillana n. sp.

Plate 116.

Twigs rather slender (2–3 mm.), fluted, for a time grayish-tomentulose. Buds light brown, glabrous and glossy, ovoid, 2×3 mm. Leaves deciduous, elliptical, obtuse, more or less cordate, entire or very obscurely repand above, very minutely revolute, rather small (2.5–3.5×5–8 cm.), essentially glabrous and somewhat glossy above, very densely and persistently rusty-tomentose beneath; veins about 10×2, looped; petiole tomentulose, scarcely 5 mm. long. Catkins ?. Fruit apparently annual, the cup with appressed acute canescent scales and the acorn elongated-ovoid, 12×18 mm., evidently included only at base.

Cordilleran region of Mexico.

Specimens examined.—Manzanilla, near Puebla (*Nicolas, 5925*, the type as sheet *1002435* in the U. S. National herbarium).

Quercus Lecomteana n. sp.

Plate 115.

Twigs rather slender (2–3 mm.), little fluted, somewhat grayish, loosely lanate. Buds glossy red, glabrescent, round-ovoid, scarcely 2 mm. in diameter, with persistent setaceous stipules. Leaves deciduous, elliptical-obovate, very obtuse to subacute, sometimes with a callous mucro, sometimes subcordately rounded at base, entire, very revolute, rather small (2–4 × 5–9 cm.), glossy and glabrescent or sparsely stellate-scurfy above, detachably dingy-short-tomentose beneath, the abraded surface not granular; veins about 8–10 × 2, branching and looped; petiole at last glabrescent and red, 1.5 × 3 mm. Catkins ?. Fruit annual, solitary or paired at the end of a peduncle 2 × 20 mm.; cup half-round, rather large (15–20 mm. in diameter), with somewhat thick-based appressed rather pointed dingy-pubescent scales; acorn round-ovoid, about half-included.

Eastern Sierra Madre region of Mexico.—A low shrub, fruiting when scarcely 15 cm. high.

Specimens examined.—Perote (*Hahn*, June 1866, the type in the herbarium of the Muséum d'Histoire Naturelle at Paris; dedicated to M. Lecomte, of that great institution).

Quercus vallicola n. sp.

Plate 116.

Twigs slender (2 mm.), little fluted, tomentose. Buds rounded, with rather deciduous stipules. Leaves deciduous, on the same branch ovate or elliptical or shortly obovate, very obtuse, rounded or slightly cordate at base, quite entire to undulately low-toothed, small (2–3 × 3–5 cm.), puberulent above, short-tomentose beneath; veins about 8 × 2, somewhat looped; petiole tomentose, 1–2 × 5 mm. Catkins ?. Fruit annual, nearly sessile; cup (immature) rounded, small, with somewhat thickened rather blunt tomentose scales; acorn ?.

Cordillera of Mexico.

Specimens examined.—Santa Fé, valley of Mexico (*Uhde, 296*, the type; *? 295*), with less looping veins and more toothed leaves.

Quercus texcocana n. sp.

Plate 117.

Twigs rather slender (2–3 mm.), somewhat fluted, densely yellowish-tomentose, becoming glabrous and gray the second season. Buds brown, glabrous, ovoid, 2 × 4 mm. Leaves deciduous, elliptical, obtuse to emarginate or mucronately subacute, more or less cordate, entire, or repand above, revolute, rather small (1.5–2.5 × 3–4.5 cm.), glossy above, dull and paler beneath, from stellate-velvety glabrescent or remaining more or less scurfy on both faces or tomentose beneath; veins about 7 × 2, evidently looped; petiole hairy, 1 × 3 mm. Catkins ?. Fruit annual, solitary and sessile, or 2–3 at end of a stout yellow-tomentose peduncle 10 mm. long, or distributed on a stalk as much as 30 mm. long; cup open and shallow, rather large (20 mm. in diameter), with thin rather close narrow acute buff scales pale-ciliate above and dingy-tomentose below; acorn ovoid, 20 mm. long, covered toward the base only, glaucous.

Mexican table land.—A shrub or small tree 1–2 or 4–5 m. high, called encino.

Specimens examined.—Cerro Texosingo, near Texcoco, at 2,400 m. (*Endlich, 653*, October 23, 1904, the type in the Berlin herbarium, *652, 654–5*); Sta. Fé, Valley of Mexico (*?Rose, Painter & Rose, 8860*). With larger rather deeply crenate leaves 3.5 × 8 cm., associated with the type (*Endlich, 655*), it is var. **ampla.**

Quercus subtriloba n. sp.

Plate 118.

Twigs slender (1–2 mm.), little fluted, dingy-tomentose, becoming glabrous and gray the second year. Buds reddish, glossy, finally glabrate, with setaceous stipules. Leaves deciduous, oblong, rounded at both ends, entire or low-repand to somewhat spatulately 3-lobed or rather

deeply about 5-lobed, revolute, small (1–2×4–6 cm.), glabrous above or somewhat puberulent on the midrib, densely creamy-rusty with rather coarsely matted hairs beneath; veins 8–15×2, obscurely looping; petiole very tomentose to glabrate, 1×5 mm. Catkins ?. Fruit annual, solitary on a tomentose peduncle scarcely 5 mm. long; cup half-round, moderate (10 mm. in diameter), with thin appressed tomentose scales; acorn ovoid, 12 mm. long, glabrate, about half-included.

Mexican table-land.

Specimens examined.—Hidalgo, without other data (*Pringle, 10303*, the type, in the U. S. National herbarium; apparently not distributed in his exsiccatae).

MICROPHYLLAE.—Shrubs or small trees with typically slender tomentose twigs, rounded buds with setaceous stipules, small subelliptical entire, crenate, or crenately serrate short-petioled revolute leaves somewhat puberulent and impressed-veiny above and firmly and densely short-tomentose beneath, and annual short-stalked fruit with little-thickened tomentose scales.—Mexican table-land and adjacent Cordillera.

Leaves deciduous.
- Entire or slightly crenate above.
  - Rather thick and crisped.....*Q. microphylla.*
  - Thin and nearly flat.
    - Entire.....*Q. Frutex.*
    - Often crenate.....v. *Uhdeana.*
- Sharply serrate above.....*Q. alpescens.*

Leaves evergreen, entire or nearly so.....*Q. repanda.*

QUERCUS MICROPHYLLA Née.

Plate 119.

Quercus microphylla Née, Anal. Cienc. Nat., vol. 3, p. 264, 1801.—Liebmann-Oersted, Chênes Amér. Trop., pl. 36.—v. Ettingshausen & Krašan, Denkschr. K. Akad. Wien, vol. 56, part 1, pl. 9.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 35.

Twigs slender (1–2 mm.), scarcely fluted, densely but rather loosely yellowish-tomentose, graying and nearly glabrescent and gray-barked the second season. Buds dull brown, from appressed-hairy glabrescent, elongated ovoid, 2×4–5 mm. Leaves deciduous, elliptical-oblong, obtuse or acute, round-based, entire to undulate or somewhat crenately few-toothed above, crisped or variously concave, revolute, small (1–2×2–4 cm.), somewhat glossy but persistently dingy-scurfy above, rather loosely and detachably dingy villous-tomentose beneath; veins about 6–8×2, impressed above, looped; petiole hairy, scarcely 1×3 mm. Catkins ?. Fruit annual, sessile, or solitary or paired on a hairy peduncle not over 10 mm. long; cup deep-saucer-shaped, moderate (10–15 mm. in diameter), with thin appressed acute reddish scales white-ciliate above and gray-tomentulose below; acorn ovoid, scarcely 15 mm. long, one-third or more included.

Mexican table-land, the type from Guanajuato.—An intricately branched low shrub.

Specimens examined.—Guanajuato (*Berlandier, 1223–4*, 1827); Somoriel to Las Lajas, Hidalgo (*Rose, Painter & Rose, 9117*); Esperanza (*Pittier, 408; Schenck, 90; Purpus, 2760*); without locality (*Pavon*, doubtless a cotype, collected by Née himself; *Aschenborn, 158; Pringle, 10309*).

Quercus Frutex n. sp.

Plate 120.

Quercus nana Fournier in herb.—not *Q. nana* Willd.

Twigs slender (1–2 mm.), scarcely fluted, tomentose. Buds brown, glabrescent, ovoid, 2×4 mm. Leaves deciduous, elliptical-ovate or oblong, rather obtuse, round-based, entire, slightly crisped and revolute, thin, small (1–1.5×3–4 cm.), puberulent above, scurfy beneath; veins about 8×2, impressed above, looped; petiole hairy, scarcely 2 mm. long. Catkins ?. Fruit annual, subsessile, resembling that of *Q. microphylla*, from which the species is barely distinguishable.

Cordillera of Mexico.—A low shrub.

Specimens examined.—Valley of Mexico. Cuautepec (*Bourgeau, 68*, the type); Sta. Fé (*Bourgeau, 645, 1007, 1010, 1015*).

With elliptical-obovate leaves 2–3 × 4–5 cm., either entire or crenate and very rusty beneath, it is var. **Uhdeana**: Valley of Mexico? (*Uhde, 295.*)

QUERCUS REPANDA Humboldt and Bonpland.

Plates 121 and 122.

Quercus repanda Humboldt & Bonpland, Plant. Aequinoct., vol. 2, p. 31, pl. 79, 1809.—v. Ettingshausen & Krašan, Denkschr. K. Akad. Wien, vol. 56, part 1, pl. 9.—Oersted, Bidrag Kundsk. Egefamil., pl. 6, f. 22.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 35.

Twigs mostly short and slender (1–2 mm.), somewhat fluted, densely rather rusty stellate-tomentose, becoming glabrate and brown with minute lenticels, or gray, the second season. Buds brown, glabrescent, ovoid, 2 × 3 mm. Leaves somewhat evergreen, elliptical, ranging into ovate or obovate, obtuse to acute, rounded at base, entire or sparingly somewhat mucronately low-toothed above, slightly crisped, revolute, small (1–2 × 3–4 cm.) sparingly scurfy but rather glossy above, densely and tightly rusty-tomentose beneath; veins about 8 × 2, forked and looping, more or less impressed above; petiole tomentose or scurfy, 1 × 5 mm. Catkins: ♂, 30–40 mm. long, densely stellate, closely flowered, the rounded glabrous anthers exserted. Fruit annual, sessile or on a stalk 10 mm. long; solitary or paired; cup deep-saucer-shaped, rather small (10–15 mm. in diameter), with thin appressed acute reddish scales tomentulose below; acorn ovoid, 15 mm. long, one-third or more included.

Mexican table-land.—A low intricately branched shrub.

Specimens examined.—Real del Monte to Moran, at 2,516 m. (*Bonpland, 4358*, the type, noted in the Paris herbarium as from El Jacal); Real del Monte (*Hartweg, 425; Ehrenberg, H, S, 925*); Omitlan (*Ehrenberg, F*); Omitlan to Huajalote (*Ehrenberg, G* in part, *992*); Minas del Monte (*Ehrenberg, 265* in part); Sta. Rosa (*Dugès*, 1895); Cuyamaloza, Hidalgo (*Pringle, 13855*); vicinity of San Luis Potosi (? *Schaffner, 266–7, 897* in part); without locality (*Pringle, 10308*).

POTOSINAE.—Rather small, with moderately slender mostly persistently tomentose twigs, round-ovoid buds with persistent stipules, small orbicular to lanceolate entire to serrately incised mostly cordate short-petioled flat leaves little venulose and finely scurfy-tomentulose on both faces, and annual short-stalked fruit with somewhat loose acute little-thickened hoary scales.—Mexican table-land and adjacent Sierra.

Leaves elliptical to orbicular, crenate to serrulate or crenately incised.
- Orbicular, crenate ..... *Q. potosina.*
- Elliptical, sharply toothed.
  - Cup rounded ..... f. *exilis.*
  - Cup flaring ..... f. *aperta.*

Leaves lanceolate, entire ..... *Q. cordifolia.*

Quercus alpescens n. sp.

Plate 122.

Twigs rather slender (2–3 mm.), very tomentose. Buds brown, glabrescent, small, ovoid. Leaves deciduous, broadly elliptical, rounded at both ends, sharply serrate, crisped and strongly revolute, small (1–1.5 × 2–2.5 cm.), reticulately impressed and subglabrous and glossy above, densely tomentose beneath; veins about 6 × 2, scarcely looped; petiole hairy, about 2 mm. long. Catkins?. Fruit annual, subsessile; cup deep-saucer-shaped, rather small (10 mm. in diameter), with thin appressed acute scales; acorn oblong, some 10 mm. long, scarcely one-third included.

Edge of the Mexican table-land.—A low shrub.

Specimens examined.—Mt. Kankandó (*Ehrenberg, 1091–3*, Jan., 1840, the types).

Quercus potosina n. sp.

Plates 123 to 125.

Twigs rather slender (2–3 mm.), little fluted, from dingy-pilose glabrescent and red-brown with prominent lenticels. Buds dull light brown, persistently hairy, acutely ovoid, 2×3 mm., with rather persistent sepals. Leaves deciduous, round-obovate, very obtuse, cordate, low-crenate, wavy, small (2.5–3×3–3.5 cm.), minutely stellate-scurfy above, densely dingy stellate-tomentose beneath; veins about 8×2, the upper passing into minute callous points, scarcely looped; petiole tomentose, 1.5×3–4 mm. Catkins ?. Fruit annual, solitary or paired, at most short-peduncled; cup half-round, moderate (15 mm. in diameter), with thin somewhat lax acute dingy-fleecy scales; acorn ovoid, scarcely half-included.

Mexican table-land.

Specimens examined.—San Luis Potosi (*Parry & Palmer, 838*, 1878, the type).

With elliptical acute sharply and coarsely serrate leaves but typical fruit, it is f. **exilis,** with the type (*Parry & Palmer, Y*). With similar but less coarsely serrate leaves and more flaring cups 20 mm. in diameter, it is f. **aperta,** with the type (*Parry & Palmer, 838b*).

Quercus cordifolia n. sp.

Plate 125.

Twigs rather slender (2–3 mm.), little fluted, from dingy-pilose glabrescent, red with inconspicuous lenticels. Buds dark red, somewhat cobwebby, subglobose, 2 mm. in diameter, at first with stipules. Leaves deciduous, elongated-ovate, mostly acute, cordate, entire, somewhat crumpled, very slightly revolute, small (1.5×4 cm.), sparsely stellate but somewhat glossy where rubbed above, dull and closely dingy-stellate beneath; veins about 8–10×2, looped; petiole tomentose, scarcely 1×5 mm. Catkins ?. Fruit annual, paired on dingy-tomentose or glabrescent peduncles 2×20–30 mm.; cup half-round, moderate (10–15 mm. in diameter), with thick-based appressed acute scales tomentose except for the dark red or blackish tips; acorn ovoid, dark brown, half-included.

Eastern Sierra Madre region of Mexico.

Specimens examined.—Sierra Madre, 40 miles south of Saltillo, Coahuila (*Palmer, 1278*, July, 1880, the type).

INTRICATAE.—Shrubs, with slender tomentose twigs, rounded buds with more or less persistent setaceous stipules, elliptical or oblong or rarely ovate small short-petioled leaves tomentulose above and densely tomentose beneath, and small annual subsessile moderate fruit with appressed hoary scales. Northern Sierra Madre region of Mexico.

Leaves subelliptical, crisped, mostly entire.....*Q. intricata.*
Leaves lance-oblong, scarcely crisped, mostly entire.....f. *angusta.*
Leaves ovate, irregularly crisped-toothed.....f. *ovata.*
Leaves round-ovate, crisped and the upper toothed.....f. *erratica.*

Quercus intricata n. nom.

Plates 126 to 128.

Quercus microphylla crispata A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 36, 1864—not *Q. crispata* Steven, Bull. Soc. Imp. Nat., Moscou, vol. 30, p. 386, 1857.

Twigs short, slender (1–2 mm.), scarcely fluted, densely short-and rather dingy-tomentose. Buds brown, glabrescent, ovoid, scarcely 2×3 mm. Leaves deciduous, subelliptical, typically acute, rather cordate and entire, revolute and often much crisped, small or very small (0.5×1–1.5 cm., or enlarging to 1×3 or even 2×5 cm.), dull, dingy stellate-scurfy above, tightly gray- or yellowish-tomentose beneath; veins about 6×2, very indistinct; petiole tomentose, 1×2–3 mm. Catkins: ♂, somewhat lanate, 5–10 mm. long and closely flowered, or 20–30 mm. and loosely flowered, the glabrous rounded anthers scarcely exserted; ♀, 5 mm. long, about 2-flowered at end. Fruit annual, nearly sessile; cup half-round, small (10 mm. in diameter), with thin appressed acute scales very tomentose below but glabrescent and red at tip; acorn rounded, nearly included.

Eastern Sierra Madre region of Mexico.—An intricately branched shrub scarcely 1 m. high.

Specimens examined.—Coahuila. Buena Vista (*Gregg, 296*, 1848–9, the type of *Q. microphylla crispata; 318*, Mar. 19, 1847); without locality (*Wislizenus*, 1846); Carneros Pass (*Pringle, 3701*); San Lorenzo Cañon, near Saltillo (*Palmer, 431, 468–9, 552–7, 745–751*, an unusually well selected series to show the range of forms). Saltillo (*?Palmer, 1178*); Sierra de Parras (*Purpus, 1137*); Sierra de la Paila (*?Endlich, 488*, from a shrub becoming a small tree 2–4 m. high). Zacatecas. Cedros (*?Lloyd, 130*).

Among the less typical forms, the following may be distinguished: f. **angusta,** with narrowly oblong usually entire leaves (*Pringle, 13286*); f. **ovata,** with ovate crenately toothed leaves 2×4 cm., rather large for the species (*Palmer, 746*); f. **erratica,** with small round-ovate leaves, sharply toothed toward the ends of the branches (*Pringle, 2862*).

CHIHUAHUENSES.—Small, with more or less slender mostly tomentose twigs, round-ovoid buds with persistent setaceous stipules, elliptical to oblanceolate small or moderate short-petioled leaves tomentulose above and usually densely tomentose beneath, and small annual stalked moderate fruit with fine appressed hoary or whitened scales mostly with red or brown tips.—Chihuahuan region of Mexico.

Leaves not revolute.
- Veinlets concealed by the tomentum.
  - Leaves broadly elliptical.
    - Irregularly shouldered or toothed ..... *Q. chihuahuensis.*
    - Mostly entire ..... f. *microphylloides.*
  - Leaves elliptical-oblong or oblanceolate.
    - Entire or somewhat toothed ..... f. *tenuis.*
    - Crenately shallow-lobed.
      - Scarcely cordate ..... f. *amplifolia.*
      - Cordate ..... *Q. jaliscensis.*
- Veinlets distinct beneath.
  - Leaves distinctly toothed.
    - Round-obovate ..... *Q. jaralensis.*
    - Oblong-obovate ..... f. *Berlandieri.*
  - Leaves subentire ..... *Q. undata.*

Leaves revolute, coarsely toothed ..... *Q. infralutea.*

Quercus chihuahuensis n. sp.

Plates 129 to 131.

Twigs moderate (3 mm.), somewhat fluted, staringly yellowish-tomentose and remaining hoary for several years. Buds glossy red-brown, glabrate, round-ovoid, 2 mm. in diameter. Leaves deciduous, elliptical-oblong or obovate, obtuse, round-based or cordate, on the same specimen from entire or undulate ranging into rather deeply crenate-dentate, especially above, more or less revolute in the sinuses, moderate (3–5 or 6×6–9 or 11 cm.), blue-green and yellow-stellate, but rather glossy when abraded, above, stellate-tomentose beneath and duller when abraded; veins about 8–10×2, often with evanescent intermediates, frequently branching, obscurely looped near the margin if at all, the reticulation little raised; petiole long-tomentose, 1.5–2×3–5 or 7 mm. Catkins: ♂, 40 mm. long, hairy, rather closely flowered, the ellipsoid glabrous anthers exserted; ♀, slender, 16–25 mm. or more long, several-flowered above. Fruit annual, on tomentose peduncles 2×15–35 or even 60 mm., either at the end or in clusters; cup half-round, rather small (10–15 mm. in diameter), with thin close rather blunt red-tipped hoary scales; acorn ovoid, half-included; the fruit varying remarkably even on the same specimen in size, form, and distribution.

Western Sierra Madre region of Mexico.—A tree 5–8 m. high.

Specimens examined.—Chihuahua. Rocky hills near Chihuahua (*Pringle, 74, 355*, the type); Mapula Mts. (*Pringle, 970*); Agua Caliente de Huachara to Basagote (*Endlich, 771*); Cosiquiriachic (*Wislizenus, 234*). Sonora. La Chumata (*?Brown*, June 7, 1905, a tree 12 m. high, with flat elliptical leaves and pistillate catkins 60 mm. long); Los Pinitos (*Hartman, 132*); Huchuerachi (*Hartman, 315; Lloyd, 465*).

Three very dissimilar forms, perhaps not really of one species, occur about Jaral: f. **amplifolia,** with crenately round-lobed very large leaves, 6×10 cm. (*Schumann, 1313*, Sept. 8, 1885); f. **tenuis,** with entire to rather sharply few-toothed subacute leaves 2–3×6–7 cm. (*Schumann, 1310* in part); and f. **microphylloides,** with very tomentose nearly entire leaves 2×4 cm. (*Schumann, 1310* in part).

Quercus jaliscensis n. sp.

Plate 132.

Twigs moderate (3–4 mm.), somewhat fluted, staringly yellow-tomentose, and remaining hoary for several years. Buds glossy brown, finally glabrate, rounded, 2 mm. in diameter, with rather persistent stipules. Leaves deciduous, elliptical ranging somewhat into ovate or obovate, acute to very obtuse, cordate, repand to almost crenately lobed, moderate (3–4×6–9 cm.), finely yellow-stellate-matted above, becoming glossy blue-green when abraded, paler, duller and detachably stellate-fleecy beneath; veins about 6–12×2, looped in the more entire forms, with little-raised reticulation; petiole long-tomentose, 2–3 mm. long. Catkins ?. Fruit annual, at the end of tomentose peduncles 2×15–30 mm.; cup half-round, moderate (15 mm. in diameter) with somewhat keeled close acute hoary scales; acorn round-ovoid, more than half-included.

Western Sierra Madre region of Mexico.

Specimens examined.—Colotlan to Plateado, Jalisco (*Rose, 2685*, the type, and *2686*, Aug. 31, 1897).

Quercus jaralensis n. sp.

Plates 133 and 134.

Twigs rather slender (2–3 mm.), more or less fluted, from dingy-pilose becoming sparsely stellate-hairy and red with rather prominent lenticels. Buds dull brown, rather persistently pubescent, ovoid, about 2×3 mm. Leaves deciduous, obovate, rather acute, cordate, pungently low-dentate, rather small (3–4×4–6 cm.), green and somewhat glossy above, paler and dull beneath, sparsely stellate on both faces; veins about 8–10×2, looped; petiole more or less long-stellate, red, 2×5–10 mm. Catkins: ♂, 60 mm. long, sparsely fleecy, the glabrous ellipsoid anthers scarcely exserted. Fruit annual, solitary or paired at end of a yellow-hairy peduncle 2×15 mm.); cup half-round, moderate (15 mm. in diameter), with thin, somewhat lax rather obtuse yellowish-canescent scales; acorn rounded, scarcely longer than the loosely fitting cup.

Chihuahuan region of Mexico.

Specimens examined.—Jaral, Coahuila (*Schumann, 1316*, Sept. 8, 1885, the type, in the Berlin herbarium). Cuesta de S. Bartolo, between Jaral and S. Felipe (*Berlandier, 1285*, Dec. 1827, with the leaves varying from elliptical and entire into lance-oblong or narrowly obovate and revolutely crenate-serrate, f. **Berlandieri**).

Quercus undata n. sp.

Plate 135.

Twigs moderate (3–4 mm.), somewhat fluted, staringly yellowish-tomentose, and remaining hoary for several years. Buds brown, from densely tomentose glabrescent, rounded, 2 mm. in diameter. Leaves deciduous ?, elliptical, very obtuse, round-based or cordate, entire or shallowly few-toothed above, typically much crisped or complicated, rather small (2.5–4×5–7 cm.), persistently but detachably yellow-tomentose on both faces, the upper rather glossy blue-green when abraded; veins about 10–12×2, looped at some distance from the margin; petiole long-tomentose, 2×5 mm., with rather persistent stipules. Catkins: ♂, 30 mm. long, fleecy, rather loosely flowered, the glabrous rounded anthers long-exserted; ♀, 2×30–50 mm., several-flowered at the end or in clusters. Fruit ?.

Western Sierra Madre region.—A tree 5–8 m. high, with weak wood, called encino blanco.

Specimens examined.—Durango, Sierra de la Candela, at 2,500 m. (*Endlich, 1*, Aug. 27, 1903, the type in the Berlin herbarium). Possibly to be referred here also: About Durango (*Palmer, 408, 828*, with small leaves, the stalked fruit with cup 15 mm. in diameter with thin appressed acute brown-tipped canescent scales and half-included acorn).

Quercus infralutea n. sp.

Plate 136.

Twigs moderate (3 mm.), little fluted, densely yellowish-tomentose, and remaining hoary for several years. Buds glossy red, glabrous but with ciliate scales, rounded, scarcely 2 mm. in diameter. Leaves deciduous, elliptical-obovate, obtuse, rounded at base, repand to typically coarsely and bluntly serrate-toothed, somewhat revolute, moderate (4–5×7–9 cm.), finally glabrescent and somewhat glossy blue-green above, closely yellow-tomentose beneath; veins about 8–10×2, obscurely looped, with evident branches; petiole tomentose, 1.5×2 mm. Flowers and fruit ?.

Western Sierra Madre region of Mexico.

Specimens examined.—Sierra de Alamos, Sonora (*Rose, Standley & Russell, 12788*, Mar. 14, 1910, the type; *Palmer, 369*).

INVAGINATAE.—Small, with rather slender tomentose twigs, round ovoid buds, deciduous stipules, small, elliptical entire to serrately incised leaves puberulent and somewhat raised-reticulate above and densely short-tomentose beneath, and annual short-stalked fruit, the rather small oblong acorns of much less diameter than the close-scaled crimped and invaginate canescent cups.—Chihuahuan region of Mexico.

Leaves coarsely toothed ..... *Q. invaginata.*
Leaves subentire ..... f. *Purpusiana.*

Quercus invaginata n. sp.

Plates 137 and 138.

Twigs rather slender (2–3 mm.), scarcely fluted, densely and persistently gray-tomentose. Buds rather glossy brown, from canescent glabrate, round-ovoid, 2×3 mm. Leaves deciduous, elliptical, rather rounded at each end or subtruncate at base, sharply serrate or dentate above, small (1.5–2×3–4 cm.), glossy green and glabrous above, shortly but densely gray- or white-tomentose beneath; veins 8–10×2, sometimes forking but hardly looped; petiole gray-tomentose, 1×5–10 mm. Catkins ?. Fruit annual, subsessile or paired on a peduncle scarcely 10 mm. long; cup turbinate, rather large, with fine appressed acute canescent scales with red tips, inflated to 20 mm. and with its margin inrolled; acorn obellipsoid, gray above, 10×15 mm., less than half included in the much larger cup.

Chihuahuan region of Mexico.

Specimens examined.—Sierra de la Paila, Coahuila (*Purpus, 5029*, Oct., 1910, the type; also *5030*, with leaves 3×5 cm. and more nearly entire, f. **Purpusiana**).

ARIZONICAE.—Small trees with rather slender tomentose twigs, ovoid buds, commonly persistent stipules, medium-sized or rather small elliptical-obovate or oblong obtuse more or less crenate or low-pungent short-petioled leaves glabrescent and somewhat impressed-reticulate above but more or less loosely velvety and veiny beneath, and medium-sized short-stalked fruit with somewhat keeled tomentose scales:—Western Sierra Madre region and Chihuahuan region on both sides of the international boundary, and adjacent Sierra.

Cup ample, campanulate; scales rather loose ..... *Q. Praeco.*
Cup moderate, half-round; scales rather close.
  Leaves moderate.
    Elliptical-obovate.
      Raised at base on either side of the petiole ..... *Q. convallata.*
      Not convallate.
        Entire to very low-denticulate.
          Rather prominently veiny beneath ..... *Q. arizonica.*
          Only slightly veiny ..... v. *Wootoni.*
        Rather coarsely low-serrate ..... *Q. pallescens.*
    Elliptical-oblong ..... *Q. Sacame.*
  Leaves short, elliptical-oblanceolate.
    Fruit rather small (10 mm. in diameter) ..... *Q. bipedalis.*
    Fruit larger (15 mm.) ..... *Q. Mohriana.*

Quercus Praeco n. sp.

Plate 139.

Twigs moderate (3–4 mm.), fluted, very densely and persistently tomentose. Buds reddish when abraded, densely yellow-tomentose through the growing season, rounded, 2–3 mm. in diameter, with persistent setaceous stipules. Leaves deciduous, elliptical or somewhat widened upwards, very obtuse, rounded at base, undulate, moderate (2.5–4.5×7–8 cm.), from minutely yellow-scurfy-tomentulose becoming glossy, blue-green when abraded and more or less impressed-reticulate above, paler and gray stellate-tomentose beneath; veins about 14×2, looped; petiole yellow-tomentose, 10 mm. long. Catkins ?. Fruit annual, mostly paired at end of a very yellow-tomentose peduncle 2×15–40 mm.; cup deeply cup- or bell-shaped, with rather coarse and loose thin acute yellowish-canescent scales with brick-red tips, abruptly inflated to 25 mm. and with its margin inrolled; acorn ellipsoid, somewhat cobwebby above, 20 mm. long, about half-included in the much larger cup.

Western Sierra Madre region of Mexico.

Specimens examined.—Huejuquilla to Mesquitec, Jalisco (*Rose, 2590*, Aug. 25, 1897, the type, in the U. S. National herbarium, as sheet no. *301512*).

Quercus convallata n. sp.

Plate 140.

Twigs moderate (3–4 mm.), scarcely fluted, gray-lanate for several years. Buds brown, rather hairy, ovoid, about 3×5 mm. Leaves deciduous, elliptical-obovate, obtuse, cordate with deeply depressed sinus, pungently dentate, moderate (4–5×8–9 cm.), thick and hard, glossy and glabrescent or sparsely scurfy above, dull and rather dingy-scurfy beneath; veins about 10×2, forking and passing into the short callous tips of the teeth, scarcely looped, not impressed; petiole gray-fleecy, 1.5×5–10 or even 15 mm. Catkins: ♂, 40 mm. long, dingy-fleecy, compactly flowered, the small round glabrous anthers scarcely exserted. Fruit ?

Western Sierra Madre region of Mexico.

Specimens examined.—Sierra de Nayarrit, Huichol, Jalisco (*Diguet*, without number, the type, in the herbarium of the Muséum d'Histoire Naturelle at Paris).

QUERCUS ARIZONICA Sargent.

Plate 141.

Quercus arizonica Sargent, Gard. & Forest, vol. 8, p. 92, 1895; Silva, vol. 8, p. 89, pl. 389.—Wooton, Bull. N. Mex. Agr. Exper. Sta. no. 51, p. 21, f.

Twigs rather slender (2–3 mm.), somewhat fluted, stellately gray-fleecy, often remaining hoary for several years. Buds rather bright red, glabrate, round-ovoid, 2 mm. in diameter. Leaves deciduous, broadly elliptical or oblong, or somewhat widened upwards, very obtuse to acute, slightly cordate, entire to distantly denticulate or very low-serrate, somewhat crisped, revolute, small (2–2.5×3–6 cm.), bluish green, glabrate, finely raised-venulose or with the larger veins slightly impressed and somewhat glossy above, paler, dull, rather prominently veined and more or less loosely stellate beneath; veins about 8–10×2, rather distinctly looped near the margin; petiole softly stellate, about 5 mm. long. Catkins ?. Fruit annual, solitary or paired on tomentose stalks scarcely 10 mm. long; cup nearly hemispherical, rather small (12 mm. in diameter), with thickened appressed acute more or less hoary reddish scales: acorn round-ovoid and half included, or elongated and scarcely one-third covered.

Western Sierra Madre region, chiefly north of the international boundary.—The Arizona white oak.

Specimens examined.—United States. Arizona. Prescott (*Toumey*, 1894); Bowie (*Jones, 4245*); Ft. Grant (*Schuut*); Oak Creek (*?Lowell*, 1910); Sabine Cañon, near Tucson (*Sargent*, 1894); Sta. Catalina Mts. (*Toumy, 2, 2850; Mayr*, 1887; *Pringle*, 1884); Rincon Mts. (*Blumer, 348*); Sta. Rita Mts. (*Engelmann & Sargent*, 1890; *Pringle*, 1881); Swissholm Mts. (*Toumey*, 1894); Chiricahua Mts. (*Blumer, 1257–9, 1275; ?Toumey*, 1894); Huachuca Mts. (*Sargent*, March 1894, taken as the type; *Wilcox*, 1892, 1894; *Toumey*, 1893–5). Boundary Region.

Guadaloupe Cañon (*Thurber, 766*, Aug., 1852). Mexico. Sonora. S. Pedro to Fronteras (*Hartman, 903–4*); S. José Mts. (*Mearns, 1633a*); Sierra Madre (*Lloyd, 466* in part). Chihuahua. Colonia Garcia (*Townsend & Barber, 361*).

Notwithstanding a very great polymorphism, the foliage of this species, which dries rather brown and has prominent venulation beneath, is usually characteristic so far as material from Arizona goes, though its Mexican representatives afford a transition to what is here called *Q. Sacame*. On the other hand, in New Mexico it approaches *grisea* and *subturbinella* in a form in which the leaves resemble those of the former species closely both in outline and coloration, while they also usually possess its rather lower venulation, var. **Wootoni:** Organ Mountains (*Wooton, I*, October 1, 1905, at Van Patten's Camp, the type, *A, B, C, E, F, G, I*, Jan. 25, 1903, at La Cueva, *420*, 1897, at an altitude of 1,400 m., and at 1,800 m. at Fillmore Cañon, April 29, 1899); Sta. Rita (*Miss Mulford, 713*); Hanover Hills (*Miss Mulford, 832*); Ft. Bayard watershed (*Blumer, 62*); north of Three Rivers (*Wooton, 3061*); Bear Mts. (*Metcalfe, 618, 755–6*); Mangas Springs (*Metcalfe, 67*).

What has been taken for a hybrid of *Q. arizonica* with *Q. grisea* (Wooton & Standley, Contr. U. S. Nat. Herb., vol. 19, p. 171, 1915) occurs in the Organ Mountains of New Mexico: $- \times Q.$ *organensis* Trelease, Proc. Am. Philos. Soc., vol. 56, p. 48, 1917.

Quercus pallescens n. sp.

Plate 141.

Twigs slender (2 mm.), scarcely fluted, gray-fleecy, with somewhat prominent lenticels when denuded. Buds light brown, glabrate, rounded, 2 mm. in diameter. Leaves deciduous, elliptical or somewhat widened upwards, rather obtuse, obliquely rounded or shallow-cordate at base, coarsely low-serrate, small (2–3 × 5–7 cm.), glossy, glabrous, and raised-venulose above, dull, pale, and very sparsely and minutely scurfy beneath, narrowly cartilaginous-revolute; veins about 7–10 × 2, rather irregularly looped; petiole from softly pubescent glabrate, 1 × 5 mm. Catkins ?. Fruit annual, usually 2 or 3 at end of a tomentose peduncle scarcely 10 mm. long; cup half-round, moderate (about 12 mm. in diameter) not contracted above, with somewhat thickened acute appressed brown-tipped canescent scales; acorn ovoid, half-included.

Western Sierra Madre region of Mexico.

Specimens examined.—Bolaños, Jalisco (*Rose, 2960*, Sept. 14–17, 1897, the type in the U. S. National herbarium, as sheet no. *301914*).

Quercus Sacame n. sp.

Plate 142.

Twigs rather slender (2–3 mm.), somewhat fluted, dingy tomentose, remaining rather persistently hoary. Buds glossy light brown, glabrous, ovoid, 1.5 × 2 mm. Leaves deciduous ?, elliptical-oblong, rather obtuse, rounded at base, entire to mostly low-serrate above with callous-tipped teeth, more or less crisped and revolute, small (2–2.5 × 4–7 cm.), glossy and slightly stellate-punctate or glabrate above, dull, paler and somewhat sparingly stellate-fleecy beneath; veins about 8–10 × 2, branching and rather indefinitely looped; petiole hairy, 3–5 mm. long. Catkins: ♂, 30 mm. long, floccose, the glabrous rounded anthers nearly sessile. Fruit ?.

Western Sierra Madre region of Mexico.—A tree 4–5 m. high, rich in tannin and yielding good wood, called rojaca sacamé or encino manzano.

Specimens examined.—Bajio de Tonachic, Sierra Madre, Chihuahua, at 2,350 m. (*Endlich, 1282, 1282a*, April, 1906, the type in the Berlin herbarium); Santiago Papasquiaro, Durango (*?Palmer, 77, 81, 85, 408*, 1896, the leaves valleculately plicate at base). Sierra de Gamon (*?Endlich, 8*).

Quercus bipedalis n. sp.

Plate 143.

Twigs slender (2 mm.), somewhat fluted, yellow- or gray-tomentose, becoming subglabrous and with small rather prominent lenticels in the second year. Buds at length glossy light brown and glabrate, rounded, 2 mm. in diameter. Leaves deciduous, elliptical or widened

upwards, mucronately obtuse to subacute, rounded at base or slightly cordate, undulate to rather sharply repand- or crenate-serrate with very short calloused teeth, very minutely subrevolute or cartilaginous-thickened, small (1–3×2.5–5.5 cm.), rather dull, minutely and openly dingy-stellulate above, paler and closely but detachably closely stellate-tufted or tomentulose beneath; veins about 10–12×2, somewhat looped, pinnately impressed above; petiole pubescent, about 3 mm. long. Catkins?. Fruit annual, solitary or paired on dingy tomentose peduncles 15 mm. long or less; cup half-round, small (10 mm. in diameter), with thin appressed acute red-tipped scales dingy- or gray-tomentulose below.

Western Sierra Madre region of Mexico.—A shrub less than 1 m. high. Varying considerably in the density and color of the pubescence of all parts.

Specimens examined.—Sta. Teresa, Tepic (*Rose*, Aug. 10, 1897, without number, the type in the U. S. National herbarium).

QUERCUS MOHRIANA Buckley.

Plate 143.

Quercus Mohriana Buckley in Rydberg, Bull. N. Y. Bot. Gard., vol. 2, p. 219, pl. 31, 1901—exclusive of the Mexican material, which is *Q. intricata*.

Southern Rocky Mountain region in Texas, the type from Devils River. Said by Sargent (Bot. Gazette, vol. 65, p. 443) to be common on the Staked Plains.

DEPRESSIPEDES.—Low, with slender glabrate twigs, rounded buds, deciduous stipules, small roundish low-toothed firm glabrous venulose short-petioled leaves, and annual sessile relatively large fruit with canescent scales.—Western Sierra Madre region of Mexico.

Leaves round-elliptic, with depressed petiole.....*Q. depressipes.*

Quercus depressipes n. sp.

Plate 144.

Twigs rather short, slender (1–2 mm.), somewhat fluted, glabrous and evanescently pruinose, red-brown, the bark soon cracking and checked like alligator skin. Buds rather glossy brown, glabrous, rounded, about 1 mm. in diameter. Leaves deciduous?, firm, round-elliptical, very obtuse or apiculate, cordate with typically closed sinus, entire or with several mucros or very short teeth above, nearly flat, very small (1–1.5×1.5–2 cm.), dull, glabrous; veins about 8×2, looped, little raised; petiole depressed through the leaf-sinus, glabrous and pruinose, as is sometimes the base of the midrib beneath, 1×2 mm. Catkins: ♂, scarcely 20 mm. long, somewhat cobwebby, rather closely flowered, the glabrous roundish anthers little exserted; ♀, short, about 2-flowered. Fruit annual, on a stellate peduncle scarcely 10 mm. long; cup flaring-hemispherical, moderate (12–15 mm. in diameter), with somewhat thickened closely appressed rather blunt dingy-canescent red-tipped scales; acorn round-ovoid, about 10 mm. long, transiently glaucous, half-included.

Western Sierra Madre region of Mexico.—A dwarf but sometimes tree-like species, less than half a meter high, known as encinillo, the acorns eaten by hogs.

Specimens examined.—Sierra de la Candela, Durango, at 3,000 m. (*Endlich*, 3, in part, Aug. 27, 1903, the type, in the Berlin herbarium.)

OBLONGIFOLIAE.—Rather small glabrate trees, or shrubs, with slender twigs, round-ovoid buds, deciduous stipules, small elliptical or oblong often entire firm glabrous more or less venulose leaves, and annual nearly sessile moderate fruit with canescent somewhat thickened scales.—Chihuahuan and Californian regions, on both sides of the international boundary.

Leaves very obtuse.
- Californian; leaves relatively broad.....*Q. Engelmanni.*
- Chihuahuan; leaves relatively elongated.
  - Leaves mostly entire.....*Q. oblongifolia.*
  - Leaves bluntly crenate-serrate above.....f. *pallidinervis.*

Leaves acute, pungently serrate.....*Q. perpallida.*

QUERCUS ENGELMANNI Greene.

Plate 144.

Quercus Engelmanni Greene, Ill. W. A. Oaks, p. 32, pl. 15, 17, 1889.—Sargent, Silva, vol. 8, p. 83, pl. 387; Manual, p. 278, f. 226.—Britton & Shafer, N. A. Trees, p. 321, f. 276.—Sudworth, For. Trees of Pac. Sl., p. 289, f. 129, 130.—Eastwood, Occ. Papers Calif. Acad., no. 9, pl. 28.
Q. Engelmannii Jepson, Fl. Calif., p. 355, 1909; Silva Calif., p. 217.

Southeastern California, reported as reaching or passing the international boundary; the type from between Los Angeles and San Diego.—The mesa oak.

A reputed hybrid with *Q. dumosa* (San Diego Co., Calif., *Greene*, June 22, 1889) appears rather to be a form of that species.

QUERCUS OBLONGIFOLIA Torrey.

Plates 145 and 146.

Quercus oblongifolia Torrey in Sitgreaves, Rept., p. 173, pl. 19, 1853.—Sargent, Silva, vol. 8, p. 87, pl. 388.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 36.—Wooton, Bull. N. Mex. Agr. Exper. Sta., no. 51, p. 22, f.

Twigs short, slender (2 mm.), scarcely fluted, quickly glabrous, often pruinose, somewhat flesh-colored. Buds red, glabrous but with ciliate scales, ovoid, 2 mm. in diameter. Leaves deciduous?, elliptical or somewhat oblong, rounded at both ends or slightly cordate, entire to coarsely crenately toothed, small (1–2×3–4 or exceptionally 3.5×8 cm.), glabrous, rather dull above, paler and very dull beneath, rather thick and flat with narrowly cartilaginous-thickened margin; veins about 6–8×2, unequal, the heavier looped, rather prominent beneath like the veinlets; petiole pale, usually somewhat pruinose, 1×5 mm. Catkins: ♂, 30 mm. long, from stellate-cobwebby glabrescent, rather closely flowered, the round glabrous anthers little exserted. Fruit annual, solitary or paired, sessile; cup half-round, rather small (12 mm. in diameter), with keeled appressed rather broad and blunt yellow-puberulent or when abraded reddish scales; acorn ovoid, pale, one-third included.

Western Sierra Madre region, on both sides of the international boundary.—A tree 5–6 m. high, or fruiting as a shrub, at different altitudes. Called blue oak or white oak.

The identification of a Canadian Pleistocene fossil oak with this southwestern species must be considered as very questionable. The specimens consist of wood only.

Specimens examined.—United States. Arizona. "Western New Mexico" (*Woodhouse*, the type in the Torrey herbarium at the New York Botanical Garden); Huachuca Mts. (*Wilcox*, 1892–4); Near Tucson (*Griffiths, 2120*); Pima Cañon (*Griffiths, 2623*); Sta. Catalina Mts. (*Lemmon, 260; Pringle*, 1881; *Thornber, 222; Toumey*, 1894, 1896, and in the Sabino Cañon, 1894, with more elongated and toothed leaves); Pinal Mts. (*Toumey*, 1894); Patagonia Mts. (*Lemmon, 262*); Chiricahua Mts. (*Blumer, 1297*). Boundary. Nogales (*Mearns, 2642*); Oro Blanco, Picacho (*Mearns, 2669*). Mexico. Chihuahua. Cerro Navaruchic (*Endlich, 1283*); Laguna Juanota (*Endlich, 3a*); Colonia Garcia (*Townsend & Barber, 455* p. p.); La Bufa, Cusihuiriachic (*Pringle, 1571*, 1887, var. *pallidinervis* with more serrate obovate pale-veined, leaves, to which is referred also *Nelson, 6309*, without locality). Sonora. La Chumata (*Brown*, May 1905); Chinochupa (*Hartman, 363*, with the leaves mostly toothed with revolute sinuses); Sierra Madre (*Hartman, 466*, p. p., *467; Lloyd, 467*); Fronteras (*Hartman, 28*).

Quercus perpallida n. sp.

Plate 147.

Glabrous. Twigs slender (2 mm.), fluted, lightly glaucous, grayish with scarcely distinguishable lenticels. Buds rather glossy brown, round-ovoid, 2×3 mm. Leaves deciduous, oblong, obtuse, truncately very slightly cordate, coarsely mucronately low-serrate, moderate (2–3×5–9 cm.), or 3–4×12–13 cm. and more deeply toothed, dull and pale, especially beneath;

veins about 10×2, often branched, at most indistinctly looped, white and with white reticulation; petiole slightly pruinose, 1×2 mm. Catkins: ♂, glabrate, the small glabrous anthers subincluded. Fruit ?.

Western Sierra Madre region of Mexico.

Specimens examined.—Sierra de Alamos, Sonora (*Rose, Standley & Russell, 13089*, Mar. 19, 1910, the type in the United States National herbarium).

OPACAE.—Rather small trees with slender glabrate twigs, rounded buds, deciduous stipules, small elliptical or lanceolate entire or toothed thick glabrous leaves without raised venulation, on short often pruinose petioles, and annual small short-stalked fruit with rather blunt mostly brown-tipped canescent scales.—Widespread through Mexico.

Leaves subaristately acute, mostly entire.
- Narrowly oblong-lanceolate, round-based ..... *Q. Pringlei.*
- Ovate, cordate ..... *Q. opaca.*

Leaves mucronate, usually obtuse.
- Relatively large (4–8 cm. long).
  - Crenate or serrate ..... *Q. sebifera.*
  - Entire ..... v. *comitanensis.*
- Small (2–3 cm. long).
  - Coarsely serrate with revolute sinuses ..... *Q. Schenckiana.*
  - Crenate-denticulate ..... *Q. ceripes.*

QUERCUS PRINGLEI von Seemen.

Plate 148.

Quercus Pringlei v. Seemen, Bot. Jahrb., vol. 29, p. 96, 1900.

Twigs very slender (1 mm.), fluted, from minutely subcanescent glabrate and from red-brown turning gray. Buds rather dull brown, glabrous, subglobose, 1 mm. in diameter. Leaves deciduous ?, lance-elliptical, bristly acute, rounded at base, entire or with one or several moderately deep serratures above, very small (0.5–1×1.5–2.5 cm.), glabrous, the upper face somewhat glossy; veins about 10–15×2, fine, looped; petiole more or less tomentose, 1×2 mm. Catkins: ♂ (immature), short and compact, with small glabrous anthers. Fruit annual, solitary or paired and sessile; cup half-round, small (10 mm. in diameter), with somewhat thickened appressed rather blunt red or brownish-tomentose scales; acorn round-ovoid, half-included or more.

Eastern Sierra Madre region of Mexico.—A shrub, 1–3 m. high.

Specimens examined.—Carneros Pass, Coahuila (*Pringle, 2382*, Sept. 1, 1889, the type, *3702*, and, in the same general region, *10199* and *13609*); Buena Vista (*Gregg, 319*, Mar. 19, 1847); San Lorenzo Cañon (*Palmer, 470*). What appears to be this species occurs in the Munich harbarium in young specimens without further data than that they were collected by *Karwinski* in 1844.

Quercus opaca n. sp.

Plate 148.

Twigs elongated, slender (1.5–2 mm.), fluted, from densely fleecy glabrescent, gray with little conspicuous lenticels. Buds brown, somewhat downy, subglobose, 2 mm. in diameter. Leaves evergreen, elliptical to ovate, mucronately acute, cordate, entire or with a few short pungent teeth above, small (1–1.5×2.5–3.5 cm.), pale, dull, and glabrous; veins about 10×2, fine, looped; petiole puberulent or soon glabrate, 1×5 mm. Catkins: ♂, 40 mm. long, caducously fleecy, somewhat closely flowered, the glabrous rounded anthers little exserted. Fruit ?.

Mexican table-land.

Specimens examined.—Ixmiquilpan, Hidalgo (*Rose, Painter & Rose, 9030*, 1905, the type in the U. S. National herbarium).

Quercus sebifera n. sp.

Plate 149.

Densely golden-tomentose when unfolding, becoming glabrous. Twigs slender (2 mm.), fluted, gray with scarcely evident lenticels. Buds glossy brown, glabrate, rounded, 2 mm. in diameter. Leaves evergreen, elliptical, subacute, rounded at base, entire or crenate-serrate often with strongly revolute sinuses, small (1.5–2×3.5–5.5 cm.), dull; veins about 8×2, looped, somewhat pruinose beneath; petiole pubescent, 1×5 mm. Catkins: ♂, 30 mm. long, floccose, rather closely flowered, the glabrous rounded anthers nearly sessile; ♀, 25 mm. long, several-flowered toward the end. Fruit annual?; cup saucer-shaped, rather small (10–12 mm. in diameter), with somewhat thickened appressed acutish canescent scales; acorn?.

Central American region.—Said to be the source of vegetable wax used for candles.

Specimens examined.—Mexico. Comitan, Chiapas, at 1,620 m. (*Cook*, *79*, June 6, 1906, the type in the U. S. National herbarium).

An entire- or serrulate-leaved form, not at all revolute, f. **comitanensis**, occurs with the type (*Cook*, *78*, June 14, 1906).

Quercus Schenckiana n. sp.

Plate 150.

Quickly glabrous. Twigs slender (2 mm.), little fluted, grayish brown with evident paler lenticels. Buds dull brown, glabrescent, subglobose, 1 mm. in diameter. Leaves deciduous?, elliptical, rounded at both ends, irregularly rather sharply few-toothed above with crisply revolute sinuses, small (1.5–2×3–4 cm.), rather dull; veins about 5–8×2 looped, the venulation prominent beneath; petiole glabrous, 1×3 mm. Catkins: ♀, 10 mm. long, glabrescent, 2- or 3-flowered at end. Fruit apparently annual, the young cup-scales thin, rounded, red, quickly glabrous.

Cordilleran region of Mexico.

Specimens examined.—Sierra de Mixteca, near S. Luis, Puebla (*Schenck*, *238*, Aug. 30, 1898, the type).

Quercus ceripes n. sp.

Plate 150.

Soon glabrous. Twigs short, slender (2 mm.), somewhat fluted, brown. Buds dull brown, glabrous, rounded, about 1 mm. in diameter. Leaves deciduous?, elliptical, rounded at both ends or very slightly cordate, irregularly low crenate-mucronate above to almost entire, very small (about 1×2 cm.), nearly flat; veins about 8–10×2, looped, not prominent; petiole blue-pruinose, 1×2–3 mm. Flowers and fruit?.

Cordilleran region of Mexico.—A shrub.

Specimens examined.—Cerro de Paxtla, near Tehuacan, Puebla (*Schenck*, *239*, Aug. 25, 1908, the type).

STRIATULAE.—Shrubs with slender tomentose twigs, rounded buds, deciduous stipules, very small elliptical entire leaves more or less pubescent on both faces and with pinnately impressed veins, and annual medium-sized subsessile fruit with thickened canescent scales.—Western Sierra Madre region of Mexico.

Acorns striate-lined.....*Q. striatula.*
Acorns not striate.....f. *otinapensis.*

Quercus striátula n. sp.

Plates 151 and 152.

Twigs slender (1–2 mm.), little fluted, from densely dingy-tomentose finally glabrescent and gray. Buds glossy light red-brown, glabrescent, subglobose, 1 mm. in diameter. Leaves deciduous, subelliptical, mucronately rather acute, rounded at base or exceptionally somewhat cordate, entire or with one or two low serratures above, somewhat concave or channeled, revolute, very small (scarcely 1×1–2 cm.), finely stellate-tufted above, minutely dingy-

tomentose beneath; veins about 6–8×2, forking and looped; somewhat pinnately impressed above; petiole canescent, 1×2 mm. Catkins?. Fruit annual, subsessile, solitary or paired; cup half-round, moderate (15 mm. in diameter), with somewhat thickened appressed acute grayish-tomentose fulvous- or purple-tipped scales; acorn subglobose, about 10 mm. long, transiently glaucous, impressed-striate (as in numerous other species), more than half included.

Western Sierra Madre region of Mexico.—A low stoloniferous shrub.

Specimens examined.—Sierra de la Candela, Durango, at 3,000 m. (*Endlich*, Aug. 27, 1903, the type, intermingled with *no. 3*, which is *Q. depressipes*, in the Berlin herbarium); Durango (*?Palmer, 806*); La Providencia, Durango, at 2,100–2,600 m. (*Nelson, 5001*); S. Julian to Cerro Prieto, Durango, at 2,300–2,800 m. (*Nelson, 4946*); Plateado, Zacatecas (*Rose, 2733*); Sta. Teresa, Tepic (*Rose, 2177*); Otinapa, Durango (*Palmer, 445*, with very dark glaucous acorns, lacking the striation, f. **otinapensis**).

GRISEAE.—Small, with slender tomentose twigs, rounded buds, deciduous stipules, small subelliptical entire venulose short-petioled leaves tomentulose beneath, and annual rather small short-stalked fruit with somewhat thickened canescent scales.—Chihuahuan region, on both sides of the international boundary.

Leaves elliptical or ovate, mucronate or subacute.....*Q. grisea.*

QUERCUS GRISEA Liebmann.

Plate 152.

Quercus grisea Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 171.—Liebmann-Oersted, Chênes Amér. Trop., p. 22, pl. 46.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 35.

Twigs slender (2 mm.), scarcely fluted, shortly yellow-tomentose, dark gray and somewhat hoary for several years. Buds red, rounded, the outer scales puberulent, scarcely 2 mm. in diameter. Leaves deciduous, elliptical passing into ovate, entire, mucronately subacute, rounded at base or slightly cordate, small (about 1.5×3 cm.), hard but thin, dull blue-green or polished where rubbed and minutely stellate above, stellate-scurfy beneath; petiole about 5 mm. long; veins about 8×2. Catkins?. Fruit annual, paired at end of a tomentose peduncle about 1×10–15 mm.; cup shallow-cup-shaped, small (10 mm. in diameter), with thin appressed rather acute canescent scales; acorn ellipsoid, some 8×12 mm., scarcely one-third included.

Chihuahuan region, chiefly north of the international boundary.

Specimens examined.—United States. Texas. Without locality (*Wright, 665*, the type, 1866); Painted Camp (*Bigelow*); Limpia Cañon (*Tracy & Earle, 211*). Mexico. Chihuahua. Colonia Garcia (*Townsend & Barber, 455*, p. p.); Northern Zacatecas (*?Lloyd, 224*).

What is held for a hybrid of *grisea* with *arizonica*, in New Mexico, is ×*Q. organensis*. A supposed New Mexican hybrid of *grisea* with the intermediate black oak *Q. Emoryi* (*Wooton, 315*) can scarcely be held to show an indication of the latter parentage.

UNDULATAE.—Shrubs or small trees with slender twigs tomentose for a time at least, rounded buds, usually deciduous stipules, small, subelliptic mostly denticulate firm little veiny short-petioled green leaves from scurfy or finely pubescent becoming glabrous above but remaining closely gray-tomentulose beneath, and annual rather small characteristically subsessile fruit with more or less thickened gray scales.—Southern Rocky Mountain and Western Sierra Madre regions.

Leaves subelliptical, very small; stipules persistent.....*Q. Toumeyi.*
Leaves elliptical-oblong.
  Pungently shallow-dentate.
    Toothed throughout; fruit peduncled.....*Q. subturbinella.*
    Entire below; peduncles short.....*Q. Hartmani.*
  Sinuately sublobed.....*Q. Rydbergiana.*
Leaves ovate-elliptical.
  Coarsely low-toothed, rather flat.
    Frequently ovate.....*Q. undulata.*
    Rather obovate.....f. *Vaseyana.*
  Pungently incised, crisped.....v. *pungens.*

QUERCUS TOUMEYI Sargent.

Plate 153.

Quercus Toumeyi Sargent, Gard. & Forest, vol. 8, p. 92, f. 13, 14, 1895; Silva, vol. 8, p. 93, pl. 391; Manual, f. 282.

Twigs short, densely leafy, slender (2 mm.), scarcely fluted, shortly yellow-tomentose. Buds small and rounded, pubescent. Leaves deciduous, elliptical, thick and flat, mucronately acute, rounded at base or slightly cordate, entire or pungently few-toothed above, very small (scarcely 1×2 cm.), glabrate or somewhat stellate or papillate above and sparsely velvety beneath; veins about 8×2, looped; petiole hairy, scarcely 2 mm. long. Catkins: ♂, 20 mm. long, somewhat hairy, the glabrous rounded anthers little exserted. Fruit annual, nearly sessile; cup half-round, small (about 8 mm. in diameter), with thin appressed rather obtuse gray-tomentulose brown scales; acorn oblong, about 12 mm. long, scarcely half-included.

Western Sierra Madre region, about the international border.

Specimens examined.—United States. Arizona. Bisbee (*Toumey*, the type; *Goodding, 711*); Chiricahua Mts. (*Toumey, 174*, 1894; *Blumer, 1280*); Ft. Huachuca (*Wilcox*, 1894). Mexico. Sonora. Without locality (*Smith*); La Chumata (*W. W. Brown*, 1905).

Very distinct in these specimens, but easily confused with the flat-leaved denticulate forms referred to *subturbinella*, *cf.* Rydberg, Bull. N. Y. Bot. Gard., vol. 2, pl. 32—Britton & Shafer, N. A. Trees, f. 277.

Quercus subturbinella n. sp.

Plate 153.

Twigs rather slender (2–3 mm.), little fluted, yellow-tomentose. Buds red-brown, at length glabrescent, rounded, 2 mm. in diameter. Leaves deciduous, elliptical-oblong, acute, slightly cordate, almost aristately undulate-dentate, somewhat scurfy on both faces and reddish beneath, flat, very small (1–1.5×2–3 cm.); petiole scurfy, 2–3 mm. long; veins about 6–8×2, scarcely looped. Catkins ?. Fruit annual, from solitary and short stalked to paired or clustered at the end of a peduncle as much as 30 mm. long; cup half round, rather small (10–12 mm. in diameter), with thin appressed acute canescent scales; acorn ovoid, one-third included.

Western Sierra Madre region, scarcely south of the international boundary.

Specimens examined.—United States. Arizona. Peach Springs (*Greene*, the type in the herbarium of the author, Rev. E. L. Greene—now at Notre Dame University—taken by him for a form of the Baja Californian *Q. turbinella*, to which it bears much the same relation that *Q. oblongifolia* does to *Q. Engelmanni*, or *Q. Wilcoxii* to *Q. Palmeri*); Copper Basin (*Toumey*, 1894); Yampai Creek (*Herb. Torrey*, 1851); Noloc (*Woodhouse*); Gallino Mts. (*Toumey*, 271). New Mexico. Without locality (*Wright, 1868*); Black Range (*Metcalfe, 1115*); Grant Co. (*Wooton*, 1902; *Rusby, 308*); Socorro Co. (*Wooton*, 1906, with minute fruit scarcely 5×6 mm.); Organ Mts. (*Wooton*, 1895); S. Antonio (*Wooton, 3859*). Colorado. Mesa Verde (*? Wetherill*, 1891).

Quercus Hartmani n. sp.

Plate 154.

Twigs short, slender (2 mm.), somewhat fluted, from stellate-villous glabrescent and red-brown, the bark quickly cracking lengthwise. Buds apparently small and rounded, red-brown, glabrous and glossy. Leaves evergreen, elliptical, acute to obtuse, rounded at base, entire or pungently serrulate toward the end, small (scarcely 1.5×3–3.5 cm.), somewhat stellate-roughened but glossy above, dull, microscopically somewhat velvety and a little hairy along the midrib beneath; veins about 8×2, looped, the venulation rather prominent beneath; petiole somewhat hairy, 1×3–5 mm. Catkins: ♂, 20 mm. long, for a time cobwebby, rather closely flowered, the rounded glabrous anthers subincluded. Fruit annual, short-stalked; cup half-round, small (10 mm. in diameter), with thin appressed rather acute brown-tipped scales; acorn oblong, one-third or more included.

Western Sierra Madre region of Mexico.—A tree 7–8 m. high.

Specimens examined.—Puerta de S. Diego, Chihuahua, at 2,100 m. (*Hartman, 633*, Apr. 12, 1891, the type); S. Luis Mts. (*Goldman, 142*, from which the fruit is described).

QUERCUS RYDBERGIANA Cockerell.

Plate 155.

Quercus Rydbergiana Cockerell, Torreya, vol. 3, p. 7, 1903.
Q. undulata Rydbergiana Cockerell, Torreya, vol. 3, p. 86, 1903.

Twigs slender, puberulent, gray-brown. Buds bright rusty, slightly puberulent. Leaves oblong, small (scarcely 1.5×3.5 cm.), firm, with several obliquely triangular mucronate lobes on each side, blue-green, yellow-stellate on both faces, veiny; petiole 3–5 mm. long. Catkins?. Fruit annual, solitary, short-stalked; cup half-round, small (8 mm. in diameter), with thickened canescent red-tipped scales; acorn barrel-shaped, 10 mm. long, one-third included.

Southern Rocky Mountain region of the United States, in New Mexico; the type from Las Vegas (*Cockerell*).—A shrub about 1 m. high.

QUERCUS UNDULATA Torrey.

Plates 155 to 157.

Quercus undulata Torrey. Ann. Lyc. N. Y., vol. 2, p. 248, pl. 4, 1828.—Nuttall, Sylva, vol. 1, pl. 3.—Greene, Ill. W. A. Oaks, pl. 13–15, 30.—Sargent, Silva, vol. 8, pl. 385.—A de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 23.
Q. undulata Jamesii, Engelmann, Trans. Acad. St. Louis, vol. 3, p. 382, 1876.

Rocky Mountain region of the United States, from New Mexico and Utah to Arizona, and in a variety reaching the Western Sierra Madre Mountains in Mexico. Called scrub oak, shin oak, or switch oak.

The type region of *Q. undulata* is said by Torrey, *l c.*, to be the source of the Canadian River, and the Rocky Mountains. Engelmann, *l. c.*, p. 372, says, "the center of distribution, perhaps, at all events the classical locality of this species, is the mountains above Cañon City, in southern Colorado." My understanding is that as now understood its range is to the east of Santa Fé and across the Staked Plains, rather than to the north.

Specimens examined of the typical form, with characteristically ovate elliptical leaves: "Rocky Mountains" (*James*, the type). New Mexico. Round Mountain (*Wooton*, 1895); Gallinas Mts. (*Wooton*, *3046–7*); White Mts. (*Wooton*, 1901); East View (*Wooton*, 1906); Agua Chiquita (*Wooton*, 1905); Gallup (*Wooton*, *3049*); Osceono Mts. (*Earle*, *115*).

With more obovate leaves than in the type, in which they are characteristically ovate, it is *Q. undulata Vaseyana* Rydberg, Bull. N. Y. Bot. Gard., vol. 2, p. 218, pl. 30, 1901.—*Q. Vaseyana* Buckley, Bull. Torr. Bot. Cl., vol. 10, p. 91, 1883, from the type region.

A scarcely separable but typically well-marked Texan form with pungently incised crisped foliage, reaching from New Mexico to the mountains of Chihuahua, is var. *pungens* Engelmann, Trans. Acad. St. Louis, vol. 3, p. 392, 1876.—*Q. undulata Wrightii* Engelmann, *l. c.*, p. 382, 1876.—*Q. pungens* Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 171; Liebmann-Oersted, Chênes Amér. Trop., pl. 45.—Rydberg, Bull. N. Y. Bot. Gard., vol. 2, p. 217, pl. 30, 1901; A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 36; but not *Q. pungens* Gandoger, Fl. Eur., vol. 21, p. 41, 1890, which is a segregate of the European *Q. lanuginosa*.—United States. Texas. [Rio Virgen] (*Wright*, *664*, the type sheet of *Q. pungens* from the Hookerian herbarium, now at the New York Botanical Garden); S Pedro to Howard's Springs (*Bigelow*). New Mexico. Queen (*Wooton*, 1909). Arizona. Without locality (*Woodhouse*, 1851); Swissholm Mts. (*Toumey*, *160*); Ft. Huachuca (*Wilcox*, 1894). Mexico. Chihuahua. Cuiteco, Sierra Madres (*Endlich*, *788*); Sta. Eulalia Mts. (*Pringle*, *172*, *353*, *849*; *Wilkinson*, *1855*).

A supposed hybrid of *pungens* with the intermediate black oak *Q. Emoryi*, from New Mexico, scarcely shows evidence of the latter parentage. ×*Q. Andrewsii* Sargent, Bot. Gaz., vol. 65, p. 455, 1918, from Oklahoma, is taken for a cross of *undulata* with *macrocarpa*.

CONFUSAE.—Shrubs or small trees with rather slender more or less pubescent twigs, rounded buds, usually deciduous stipules, moderate or rather small acute-lobed firm somewhat veiny

rather short-petioled leaves glabrate above but more or less stellate beneath, and annual medium-sized subsessile or stalked fruit with somewhat thickened canescent scales.—Southern Rocky Mountain region of the United States.

Leaves green.
- Lobes not mucronate.....*Q. venustula.*
- Lobes mucronate: fruit typically large.....*Q. Havardi.*

Leaves blue-green.
- Elliptical-oblong.
  - Fruit large.....*Q. confusa.*
  - Fruit moderate.....*Q. Fendleri.*
- Ovate.....*Q. pauciloba.*

QUERCUS VENUSTULA Greene.

Plate 158.

Quercus venustula Greene, Ill. W. A. Oaks, p. 69, pl. 32, 1890.

Rocky Mountain region of the United States, in Colorado and New Mexico; the type apparently from Trinidad, Colorado.

QUERCUS FENDLERI Liebmann.

Plate 159.

Quercus Fendleri Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 170.—Greene, Ill. W. A. Oaks, pl. 13, 20.

Q. undulata pedunculata, A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 23, 1864.

Rocky Mountain region of the United States, from Colorado into New Mexico, Western Oklahoma, Texas, and Arizona; the type from Santa Fé, New Mexico.

QUERCUS PAUCILOBA Rydberg.

Plate 160.

Quercus pauciloba Rydberg, Bull. N. Y. Bot. Gard., vol. 2, p. 215, pl. 30, 1901.—Britton & Shafer, N. A. Trees, f. 273.

Southern Rocky Mountain region of the United States, in Utah and Arizona; the type from Beaver Creek, Arizona.—MacDougal's oak.

GAMBELIEAE.—Shrubs or small trees with slender more or less pubescent twigs, rounded buds, persistent stipules, moderate or rather large blunt-lobed firm somewhat veiny moderately petioled leaves, glabrescent above but somewhat stellate beneath, and annual subsessile fruit with canescent scales somewhat thickened in all but two species.—Rocky Mountain and mountainous Sonoran region of the United States.

Cups of fruit fringed around the margin.
- Leaves subacute; buds small, nearly globose.....×*Q. Andrewsii.*
- Leaves obtuse; buds elongated.....*Q. guadalupensis.*

QUERCUS HAVARDI Rydberg.

Plate 160.

Quercus Havardi Rydberg, Bull. N. Y. Bot. Gard., vol. 2, p. 213, pl. 29, 1901. (The name is spelled *Havardii* in the author's key.)

Southern Rocky Mountain region of the United States, in Texas and New Mexico; the type from the Staked Plains of Texas. Called shinnnery oak.

QUERCUS CONFUSA Wooton & Standley.

Plate 161.

Quercus confusa Wooton & Standley, Contr. U. S. Nat. Herb., vol. 16, p. 116, 1913; vol. 19, p. 169, 1915.

Rocky Mountain region; the type from Ruidoso, New Mexico.

Cups not fringed.
Leaves broadly obovate.
Green.
Sinuses nearly closed; lobes crenate.....*Q. Eastwoodiae.*
Sinuses open.....*Q. utahensis.*
Blue-green; lobing shallow.....*Q. obtusifolia.*
Leaves elliptical- or oblong-obovate, green.
Scales of cup not thickened.
Leaves puberulent; base blunt.....*Q. submollis.*
Leaves glabrescent; base rather acute.....*Q. leptophylla.*
Scales of cup thickened.
Leaves rather obtuse or abrupt at base.
Lobes entire.....*Q. media.*
Lobes subtruncately bilobed.
Sinuses moderate.....*Q. nitescens.*
Sinuses very deep.....*Q. novomexicana Andrewsi.*
Lobes scarcely truncate.....*Q. novomexicana.*
Leaves distinctly cuneate.
Cup half-round.
Leaves pale beneath; acorn elongated.....*Q. Gambelii.*
Leaves scarcely pale beneath; acorn short.....*Q. Gunnisonii.*
Cup saucer-shaped.....*Q. Vreelandii.*

QUERCUS EASTWOODIAE Rydberg.

Plate 162.

Quercus Eastwoodiae Rydberg, Bull. N. Y. Bot. Gard., vol. 2, p. 210, pl. 28, 1901.

Southern Rocky Mountain region of the United States; the type from Butler Wash, Utah; and not known outside of Utah.

QUERCUS UTAHENSIS Rydberg.

Plate 158.

Quercus utahensis Rydberg, Bull. N. Y. Bot. Gard., vol. 2, p. 202, pl. 25, 1901.—Britton & Shafer, N. A. Trees, f. 297.

Q. stellata utahensis A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 22, 1864.

Western Rocky Mountain region of the United States from Wyoming through Colorado, Utah, and New Mexico to Arizona; the type from Utah, between Salt Lake City and the mountains.

QUERCUS OBTUSIFOLIA Rydberg.

Plate 162.

Quercus obtusifolia Rydberg, Bull. N. Y. Bot. Gard., vol. 2, p. 213, pl. 29, 1901.

Q. undulata obtusifolia A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 23, 1864.

Q. undulata Sargent, Silva, vol. 8, pl. 385, f. 13 only.

Rocky Mountain region of the United States, in Texas, New Mexico, and Arizona; the type from Santa Fé, New Mexico.

QUERCUS SUBMOLLIS Rydberg.

Plate 163.

Quercus submollis Rydberg, Bull. N. Y. Bot. Gard., vol. 2, p. 202, pl. 25, 1901.—Britton & Shafer, N. A. Trees, f. 296.

Q. utahensis submollis Sargent, Bot. Gazette, vol. 65, p. 442, 1918.

Southern Rocky Mountain region of the United States, from Nevada through Utah and New Mexico to Arizona; the type from the Huachuca Mts., Ariz.

QUERCUS LEPTOPHYLLA Rydberg.

Plate 163.

Quercus leptophylla Rydberg, Bull. N. Y. Bot. Gard., vol. 2, p. 205, pl. 26, 1901.—Britton & Shafer, N. A. Trees, f. 298.

Rocky Mountain region of the United States, in Colorado and New Mexico; the type from Turkey Creek, Colo.

QUERCUS MEDIA Wooton & Standley.

Plate 161.

Quercus media Wooton & Standley, Contr. U. S. Nat. Herb., vol. 16, p. 116, 1913; vol. 19, p. 171, 1915.

Rocky Mountain region of the United States, in New Mexico; the type from Glorieta, New Mexico.

QUERCUS NITESCENS Rydberg.

Plate 164.

Quercus nitescens Rydberg, Bull. N. Y. Bot. Gard., vol. 2, p. 207, pl. 27, 1901.

Rocky Mountain region of the United States, in Colorado and New Mexico; the type from La Veta, Colorado (*Vreeland, 677*).

QUERCUS NOVOMEXICANA Rydberg.

Plates 164 and 165.

Quercus novomexicana Rydberg, Bull. N. Y. Bot. Gard., vol. 2, p. 208, pl. 27, 1901.
Q. Douglasii novomexicana A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 24, 1864.
Q. Gambellii, in part, Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 169.—Liebmann-Oersted, Chênes Amér. Trop., p. 22, pl. 40.

Rocky Mountain region of the United States, from Colorado and Utah through New Mexico to Arizona; the type from Santa Fé, New Mexico.

A form with the oblong lobes separated nearly to the midrib by equally wide sinuses may be known as var. **Andrewsii** (Colorado Springs to Palmer Lake, Colorado, *Andrews*, 1916).

QUERCUS GAMBELII Nuttall.

Plate 158.

Quercus Gambelii Nuttall, Journ. Acad. Philadelphia, n. s., vol. 1, part 2, p. 179, 1848.—Torrey, Sitgreaves' Rep., pl. 18.—Liebmann-Oersted, Chênes Amér. Trop., pl. 40.—Greene, Ill. W. A. Oaks, pl. 13, 33.—Sargent, Silva, vol. 8, pl. 366–7; Manual, f. 214.
Q. Gambellii Liebmann, in part, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 169.
Q. Douglasii Gambelii A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 23, 1864.
Q. undulata Gambelii Engelmann, Trans. Acad. St. Louis, vol. 3, p. 382, 392, 1876–7.

Rocky Mountain region of the United States, from Wyoming through Colorado, Utah, and New Mexico to Arizona; the type from the Rio Grande, near Santa Fé.—Called white oak cr shin oak.

QUERCUS GUNNISONII Rydberg.

Plate 166.

Quercus Gunnisonii Rydberg, Bull. N. Y. Bot. Gard., vol. 2, p. 206, pl. 26, 1901.
Q. alba Gunnisonii Torrey, Rep. Pac. R. R. Surv., vol. 2, part 1, p. 130, 1855.
Q. Gambelii Gunnisonii Wenzig, Jahrb. Bot. Gart. Berlin, vol. 3, p. 190, 1885.

Rocky Mountain region of the United States, from Colorado and Utah through New Mexico to Arizona; the type from Cochelopa Pass, Colorado.

QUERCUS VREELANDII Rydberg.

Plate 166.

Quercus Vreelandii Rydberg, Bull. N. Y. Bot. Gard., vol. 2, p. 204, pl. 25. 1901.

Rocky mountain region of the United States, in Colorado and New Mexico; the type from La Veta, Colorado (*Vreeland, 685*).

LOBATAE.—Rather large trees or exceptionally shrubs with slender pubescent twigs, ovoid buds, deciduous stipules, moderate obovate deeply lobed petioled leaves stellate or glabrous above but velvety beneath, and annual subsessile fruit with elongated acorns and more or less thickened appressed ashen scales.—Californian region.

Trees:
Acorns long and pointed; cups deep.....*Q. lobata.*
Acorns usually short, swollen and blunt: cups shallow.....*Q. Garryana.*
Shrubs.....*Q. Oerstediana.*

QUERCUS LOBATA Née.

Plate 168.

Quercus lobata Née, An. Cienc. Natur., vol. 3, p. 277, 1801.—Torrey, Bot. Wilkes Exped., pl. 15.—Liebmann-Oersted, Chênes Amér. Trop., pl. 42.—Robert Brown, Campst., Horae Sylvanae, p. 52, f. 1–3.—Greene, Ill. W. A. Oaks, pl. 8.—Sargent, Silva, vol. 8, pl. 362; Manual, f. 212.—Britton & Shafer, N. A. Trees, f. 293.—Sudworth, Forest Tr. of Pac. Slope, f. 123.—Dippel, Handb., vol. 2, p. 76, f. 29.—Jepson, Fl. Calif., f. 62–3; Silva Calif., pl. 1, 14, 60–66.—Eastwood, Occ. Papers Calif. Acad., no. 9, pl. 27.—Pammel, Proc. Iowa Acad., vol. 23, pl. 38.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 24.

Q. Hindsii Bentham, Bot. Sulphur, p. 55, 1844.—Newberry, Rept. Pac. R. R., vol. 6, pl. 1.—Liebmann-Oersted, Chênes Amér. Trop., pl. 42.

Q. longiglanda Frémont, Geogr. Mem. Upper Calif. (Senate Doc., 30th Congress, first sess., Miscellaneous, no. 148), p. 15, 17, 1848.

Q. lobata Hindsii Wenzig, Jahrb. Bot. Gart. Berlin, vol. 3, p. 188, 1885.

Western Californian region, confined to California; the type from Monterey.—The Californian white oak, valley oak, weeping oak, swamp oak, or roble.

Though described by Née, the typical material of this species is said to have been collected in 1792 by Robredo and Esquerra. Specimens collected at the same time by Haenke, and probably equally typical, occur in the herbarium of the National Museum at Prag.

Several varieties have been differentiated by Jepson (Fl. Calif., p. 353–4, f. 6, 1909): *argillosa, insperata, rarita, turbinata, Walterii.*

A hybrid of *lobata* and *Douglasii* is ×*Q. jolonensis* Sargent, Bot. Gazette, vol. 65, p. 456, 1918.

QUERCUS GARRYANA Douglas.

Plates 167 and 168.

Quercus Garryana Douglas in Hooker, Fl. Bor.-Amer., vol. 2, p. 159, 1840.—Nuttall, Sylva, vol. 1, pl. 1.—Liebmann-Oersted, Chênes Amér. Trop., pl. 40.—Greene, Ill. W. A. Oaks, pl. 7.—Sargent, Silva, vol. 8, pl. 364–5; Manual, f. 213.—Sudworth, Forest Tr. Pac. Slope, f. 125.—Britton & Shafer, N. A. Trees, f. 295.—Jepson, Silva Calif., pl. 67.—Eastwood, Occ. Papers Calif., Acad., 9, pl. 27.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 24.

Q. Neaei Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 173.—Liebmann-Oersted, Chênes Amér. Trop., pl. 41.

Q. Douglasii Neaei A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 24, 1864.

Q. Jacobi Robert Brown, Campst., Ann. & Mag. Nat. Hist., ser. 4, vol. 7, p. 255, 1871.—Greene, Ill. W. A. Oaks, pl. 35–6.

Q. Garryana Jacobi Zabel in Beissner, Schelle & Zabel, Handbuch., p. 74, 1903.

Western Californian region, from Vancouver Island, British Columbia, through Washington, Oregon, and California; the type from Puget Sound.—Called Oregon oak, white oak, or mountain white oak.

A supposed hybrid between this and *Q. Douglasii* has been reported by Jepson (Pac. Rural Pres., vol. 57, p. 9, 1909; Silva Cal., 215), but specimens that Professor Jepson has kindly sent me scarcely show *Garryana* parentage to my eye.

The Kaweah oak is segregated under the formal name *semota* by Jepson (Fl. Calif., p. 354, 1909).

QUERCUS OERSTEDIANA Robert Brown, Campst.

Plate 168.

Quercus Oerstediana Robert Brown, Campst., Ann. & Mag. Nat. Hist., ser. 4, vol. 7, p. 250, 1871.—Greene, Ill. W. A. Oaks, pl. 10–11.

Q. lobata fruticosa Engelmann, Trans. Acad. St. Louis, vol. 3, p. 389, 1877.

Q. Breweri Engelmann in Brewer & Watson, Bot. Calif., vol. 2, p. 96, 1880.—Sargent, Silva, vol. 8, pl. 363.—Sudworth, Forest Tr. Pac. Slope, f. 124.

Q. lobata Breweri Wenzig, Jahrb. Bot. Gart. Berlin, vol. 3, p. 188, 1885.

Q. Garryana Breweri Jepson, Fl. Calif., p. 354, 1909; Silva Calif., pl. 67.

Californian region, confined to the Western Sierras; the type from Mt. Shasta.

DURANDIEAE.—Mostly small trees with slender glabrous twigs, round-ovoid brown glabrous buds, deciduous stipules, oblong to obovate rather small short-petioled leaves venulose and glabrous above but typically whitened and minutely tomentose beneath, and annual subsessile small fruit with usually thin appressed canescent scales.—Southern Atlantic region of the United States, reaching to west-central Texas, and to the edge of the Eastern Sierra Madre in Mexico.

Leaves elliptical-oblanceolate to obovate, undulate or shallowly round-lobed.
  Rather large trees. Eastern.
    Leaves green beneath.....*Q. sinuata.*
    Leaves pale beneath.....f. *Durandii.*
  Shrubs or small trees. Western.
    Leaves pale beneath.
      Cup scales thin.....*Q. breviloba.*
      Cup scales thickened.....f. *Laceyi.*
    Leaves green beneath.....f. *san-sabia.*
Leaves oblong, deeply lobed, whitened beneath.....f. *argentata.*
Leaves oblong, slightly repand-toothed, persistently white-tomentose beneath .....*Q. sillae.*

QUERCUS SINUATA Walter.

Plates 169 to 171.

Quercus sinuata Walter, Fl. Carol., p. 235, 1788.
Q. austrina Small, Fl. S. E. U. S., p. 353, 1329, 1903.—Britton & Shafer, N. A. Trees, f. 281.—Sargent, Bot. Gazette, vol. 65, p. 435, where identity with *Q. sinuata* is not admitted.

Atlantic region of the United States, from South Carolina to Alabama and eastern Texas; the type from South Carolina, and the type of *Q. austrina* from Gallian, Alabama.—The green-leaved bastard oak.

Mr. Ashe's conclusions (Proc. Soc. Amer. Foresters, vol. 11, p. 89, 1916) are followed in applying to this oak the name *sinuata* which Engelmann and others have considered to belong to the hybrid of *laevis* and *nigra* which Ashe renames $\times Q.$ *Walteriana.*

As with *Q. bicolor*, *Q. lyrata*, etc., the species includes a form with the leaves green beneath and one in which they are very silvery beneath. In this case, the scarcely distinct silvery form is *Q. Durandii* Buckley (Proc. Acad. Philadelphia, 1860, p. 445; 1881, p. 121–2.—Rydberg, Bull. N. Y. Bot. Gard., vol. 2, p. 215.—Britton & Shafer, N. A. Trees, f. 279.—Trelease, Winter Botany, p. 30, f. 13.—*Q. breviloba* Sargent, Silva, vol. 8, p. 71, pl. 384; Manual, f. 223, as to eastern trees), the type of which came from Wilcox, Alabama. If the identity of *Q. austrina* is not admitted, and Mr. Ashe seems to question it in a later publication (Bull. Charleston Museum, vol. 14, p. 11, 1918), the species will be called *Q. Durandii*, with the synonymy here given, its green-leaved form being f. *austrina* with the references given under *Q. austrina*, above.

QUERCUS BREVILOBA Sargent.

Plate 170.

Quercus breviloba Sargent, Garden & Forest, vol. 8, p. 93, 1895; Silva, vol. 8, p. 71, in both as to the western type.—Rydberg, Bull. N. Y. Bot. Gard., vol. 2, p. 215.—Britton & Shafer, N. A. Trees, f. 272.
Q. obtusifolia breviloba Torrey, Rept. U. S. & Mex. Bound. Surv., vol. 2, part 1, p. 206, 1859.
Q. annulata Buckley, Proc. Acad. Philadelphia, 1860, p. 445.—Sargent, Bot. Gazette, vol. 65, p. 443.—Not *Q. annulata* Smith in Rees, Cyclop., vol. 29, *Quercus* no. 22, 1819, nor Korthals, Verhand. Nederland. Overzee. Bezitt. Bot., p. 213, 1839–1842 (1841?).

Twigs rather slender, scarcely fluted, glabrous, buff, with small prominent lenticels. Leaves deciduous, elliptical-obovate, usually undulately shallowly few-lobed, obtuse, typically acute at base, glabrous and glossy green above, pale but glabrate beneath, rather small (about 3×6 cm. or of twice this size); veins about 8×2, looping; petiole glabrous, scarcely 2 mm. long. Catkins? Fruit annual, subsessile, solitary or paired; cup half-round, small (scarcely 10 mm. in diameter), with thin acute appressed ashen scales; acorn ovoid-oblong, about one-third included.

Eastern Sierra Madre region; the type from Howard County, Texas; reaching to Monterey, Nuevo Leon, in Mexico (*Berlandier 146, 1400, 1406, 1781; Sargent*, 1877).—Called white oak, or shin oak.

What would be taken for *Q. breviloba*, except that its cup-scales are more thickened, is f. **Laceyi** (*Q. Laceyi* Small, Bull. Torr. Bot. Cl., vol. 28, p. 358, 1901.—Britton & Shafer, N. A. Trees, f. 280), the type of which came from Kerr County, Texas. In western Texas it occurs with more elongated crisped and deeply lobed leaves, very silvery beneath, f. **argentata** (Colorado City, *Havard, 54*). The ordinary form but with leaves green beneath, is f. *san sabia* Buckley (Bull. Torrey Bot. Cl., vol. 10, p. 91, 1883.—*Q. san sabeana* Young, Bot. Texas, p. 507, 1873); but material from San Saba County, Texas, labeled by Buckley as representing this form, has the leaves whitened beneath, and the character is scarcely more dependable than in *Q. lyrata*, etc.

Adoption for the shin oak, of the name *breviloba*, dating varietally from 1859 and specifically from 1895, instead of the name *annulata* dating specifically from 1860, is not in accord with the international rules of nomenclature adopted by the Vienna Botanical Congress of 1905, but conforms to the prevalent American practice based on the statement "once a synonym always a synonym," and therefore finds the specific name *annulata* preoccupied for either of two other oaks—now regarded as properly bearing other names but possibly to be reinstated as opinions on specific identity and distinctness change in the course of time.

Quercus sillae n. sp.

Plate 171.

Twigs slender (1–2 mm.), fluted, glabrous. Leaves deciduous, oblong, entire to undulately few-toothed, subacute, rather blunt at base, glabrous and glossy above, minutely but densely ashen-tomentulose beneath, small (about 1.5×4 cm.); veins about 12×2, rather obscurely looping; petiole glabrous, some 2 mm. long. Catkins?. Fruit (young) annual, sessile, solitary or paired; cup with thin acute appressed rather coarse gray scales.

Eastern Sierra Madre region of Mexico.

Specimens examined.—La Silla, near Monterrey (*Pringle, 11332*, the type).

ALBAE.—Trees, often of large size, with rather slender typically glabrous twigs, mostly round glabrous buds, deciduous stipules, mostly large obovate characteristically deeply blunt-lobed moderately petioled venulose glabrate leaves, and annual variously stalked or sessile moderate or small fruit with more or less thickened appressed gray scales.—Atlantic region of the United States.

Buds round-ovoid, short (2–3 mm.) and blunt.
- Leaves sinuate or repand.....*Q. alba repanda.*
- Leaves variously narrow and entire to broad and laciniate.....*Q. alba heterophylla.*
- Leaves lobed.
  - Lobes falcately pectinate.....*Q. alba Ryderi.*
  - Lobes not at all pectinate.
    - Lobes entire, or the upper round-shouldered.
      - Cup-scales thin, canescent.....×*Q. Faroni.*
      - Cup-scales tuberculate at base.
        - Leaves green beneath.....*Q. alba viridis.*
        - Leaves whitened beneath.
          - Fruit small (under 10 mm. in diameter).....*Q. alba microcarpa.*
          - Fruit distinctly larger.....*Q. alba latiloba.*
    - Lobes acutely or truncately shouldered.
      - Fruit subsessile.....*Q. alba sublyrata.*
      - Fruit long-stalked.....×*Q. Jackiana.*
    - Lobes again lobed.....*Q. alba.*

Buds subellipsoid, larger (3×5 mm.); twigs canescent.....×*Q. Fernowi.*
Buds conical-ovoid, large (3×5 mm.) and acute; twigs glabrous.
Buds light brown; cross-veins of leaf prominent.....×*Q. Saulii.*
Buds red-brown; veining less prominent.....*Q. alba longigemma.*

QUERCUS ALBA Linnaeus.

Plates 8 and 172 to 175.

Quercus alba Linnaeus, Sp. Pl., vol. 2, p. 996, 1753.—Du Roi, Harbk. Baumz., vol. 2, pl. 5.—Wangenheim, Beitr. Nordam. Holz., pl. 3.—Michaux, f., Hist. Arb. Amér., vol. 2, pl. 1; N. A. Sylva, vol. 1, pl. 1.—Smith & Abbot, Insects of Ga., vol. 2, pl. 87.—Audubon, Birds, pl. 107, 147.—Bentley & Trimen, Med. Pl., vol. 4, pl. 250.—Brendel, Trans. Ill. Agr. Soc., vol. 3, pl. 1.—Emerson, Trees Mass., pl. 1.—Emerson & Weed, Our Trees, p. 137, pl.—Houba, Chênes Amér. en Belg., pl. 1–2.—Liebmann-Oersted, Chênes Amér. Trop., pl. 33.—Vasey, Amer. Entom. & Bot., vol. 2, p. 249, f. 156.—Sargent, Silva, vol. 8, pl. 356–8; Manual, f. 211.—Gray, Manual, 7 ed., f. 670.—Britton & Shafer, N. A. Trees, f. 301.—Lewis, Trees of Texas (Bull. Univ. Texas., 1915, no. 2), f. 8.—Clements *et al.*, Minn. Trees & Shr., p. 264.—Deam, Rept. Indiana Bd. Forestry, vol. 11, pl. 43.—Hough, Handbook, p. 164, ff.—Rowlee & Nichols, Bot. Gaz., vol. 29, p. 354, f. 2.—Cobb, Proc. Am. Philos. Soc., vol. 54, pl. 4.—Burns & Otis, Trees of Vt., p. 115, pl.—Pammel, Trans. Iowa Hort. Soc., vol. 51, p. 96. pl.—Trelease, Winter Botany, p. 30, f. 14.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 22.

? *Q. candida* Steudel, Nomenclator, ed. 2, p. 426, 1841.—Name only.

Throughout the Atlantic region of the United States and Canada, from Ontario to Florida, Texas, and Minnesota; the type, "Virginia," probably from the Carolinas. Fossil in Pleistocene deposits as *Q. alba* and *Q. pseudo-alba*.—The white oak, ridge white oak, or stave oak.

The many forms under which the white oak occurs are too interknit in characters and of too little known constancy to be more than formally separated, as has been done in the foregoing key. They have no identifiable literature except for *Q. alba microcarpa* A de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 22, 1864; *Q. alba repanda* Michaux, f., Hist. Chênes Amér., pl. 5, 1801.—Loudon, Arbor. Brit., f. 1569–1570.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 22 (*Q. alba* Guimpel & Hayne, Holz, pl. 160.—*Q. repanda* Rafinesque, Alsogr. Amer., p. 19, 1838); *Q. alba pinnatifida* Michaux, f., Hist. Chênes Amér., pl. 5, 1801, now held to be true *alba; Q. alba latiloba* Sargent, Bot. Gazette, vol. 65, p. 454–5, 1918, what has been taken currently for the type of the species; and *Q. alba heterophylla* von Ettingshausen & Krašan, Denkschr. Akad. Wien, Math.-Naturw. Cl., vol. 56, p. 63, pl. 14, 1889, which, as here meant, includes a diverse assemblage of foliage one type of which is figured by Britton, Bull. Torr. Bot. Cl., vol. 8, p. 126. The peculiar-leaved form called f. **sublyrata** (Natchez, Miss., *Sterrett, 11*) may be regarded as an extreme of this.

The following hybrids occur: ×*Q. Bebbiana* Schneider, Handb., vol. 1, p. 201, 1904 (figured by Sargent, Silva, vol. 8, pl. 360), with *Q. macrocarpa;* ×*Q. Beadlei* Trelease, Proc. Amer. Philos. Soc., vol. 56, p. 48, 1917, with *Q. Prinus;* ×*Q. Deami* Trelease, *l. c.*, p. 49 (figured by Deam, Rept. Indiana Bd. Forestry, vol. 11, pl. 44), with *Q. Muehlenbergii;* ×*Q. Fazoni* Trelease, *l. c.*, p. 49, with *Q. prinoides;* ×*Q. Fernowi* Trelease, *l. c.*, p. 49 (figured by Vasey, Bull. Torr. Bot. Cl., vol. 10, pl. 29, 30.—Sargent, Silva, vol. 8, pl. 359.—*Q. bernardiensis* Wolf, Torreya, vol. 18, p. 161, 1918), with *Q. stellata;* ×*Q. Jackiana* Schneider, Handb., vol. 1, p. 202, 1904 (Knowlton & Deane, Rhodora, vol. 16, p. 113), with *Q. bicolor;* and ×*Q. Saulii* Schneider, Handb., vol. 1, p. 203, 1904 (figured by Vasey, Bull. Torr. Bot. Cl., vol. 10, pl. 28.—Sargent, Silva, vol. 8, pl. 361), with *Q. montana*.

STELLATAE.—Small trees or shrubs, with somewhat thick tomentulose or more or less glabrate twigs, round-ovoid or pentagonal often hairy buds, deciduous stipules, moderate or large obovate undulate to deeply blunt-lobed moderately petioled venulose leaves stellate-pubescent at least beneath, and annual short-stalked rather small fruit with characteristically thin appressed gray scales.—Atlantic region of the United States.

Leaves roughened above with sparse tufts of stellate hairs, tomentulose or glabrescent beneath; or else the leaves large or the twigs yellow-tomentulose.
- Leaves prevailingly large (5 or 7–10×9–12 cm.).
  - Twigs yellow, commonly tomentulose.
    - Leaves obovate, usually lyrately lobed, exceptionally subrepand.
      - Largest lobes broad, rounded or truncate or with a secondary lobe toward the end.
        - Middle lobes moderate or else rounded or again lobed.
          - Twigs yellow-tomentulose.
            - Leaves tomentulose or glabrate beneath.
              - Roughened on the upper surface ..... *Q. stellata.*
              - Quite smooth to the touch ..... f. *laevis.*
            - Leaves detachably woolly beneath ..... f. *mollissima.*
          - Twigs becoming glabrous in age ..... f. *tonsa.*
        - Middle lobes very large and square ..... f. *quadrata.*
      - Largest lobes T-shaped or with 2 subequal often again lobed apical lobes ..... f. *Sterretti.*
    - Leaves spatulate-oblong, chiefly 3-lobed at end ..... f. *attenuata.*
    - Leaves oblong-oblanceolate.
      - With about 9 short rounded lobes ..... f. *Houbae.*
      - With 5 or 7 mostly ascending lobes ..... f. *attenuata.*
      - Falcately about 7-lobed.
        - Upper lobes often obliquely truncate ..... v. *Palmeri.*
        - Lobes not truncate, very obtuse ..... ×*Q. substellata.*
      - Lyrately about 5-lobed ..... *Q. stellata oblonga.*
      - Dilated above, with about 3 lobes ..... f. *paludosa.*
  - Twigs reddish, glabrous ..... *Q. Margaretta intermedia.*
- Leaves prevailingly small (scarcely 6×8 cm.); twigs yellow-tomentose.
  - Lobes of the rather oblong leaf about 7, short and rounded ..... *Q. stellata rufescens.*
  - Lobes about 7, the upper often obliquely truncate ..... v. *Palmeri.*
  - Lobes mostly 3 or 5, sometimes truncate.
    - Leaves detachably woolly beneath ..... f. *mollissima.*
    - Leaves only tomentulose beneath.
      - Outline and lobing as in the large-leaved type ..... f. *reducta.*
      - Leaves short, broad and cross-shaped ..... f. *cruciformis.*
      - Leaves often trapeziform with acute lobes ..... f. *parviloba.*
  - Margin repand or coarsely crenate rather than lobed.
    - Leaves rather oblong, rough above ..... f. *rufescens.*
    - Leaves rather obovate and smooth above ..... f. *anomala.*

Leaves usually smooth above, comparatively small.
- Leaves conspicuously lobed, at first loosely stellate-pubescent beneath; twigs commonly glabrescent in age.
  - Twigs yellow or orange or olive: buds light brown ..... ×*Q. pseudomargaretta.*
  - Twigs reddish: buds characteristically blood-red.
    - Leaves glossy above, as in *stellata.*
      - Small trees.
        - Bark checked as in *stellata* ..... *Q. Margaretta.*
        - Bark scaly ..... f. *araniosa.*
      - Suckering shrubs ..... f. *stolonifera.*
    - Leaves dull above, as in *alba* ..... f. *Peltieri.*
- Leaves mostly undulately short-lobed; twigs rather persistently tomentulose.
  - Southeastern.
    - Leaves oblanceolate-oblong; petiole rather long (15–25 mm.) ..... *Q. Boyntoni.*
    - Leaves elliptical-obovate, thick; petiole very short ..... *Q. Chapmani.*
  - Southwestern.
    - Leaves oblong-obovate, repand: petiole very short ..... *Q. stellata anomala.*

QUERCUS STELLATA Wangenheim.

Plates 10 and 177 to 182.

Quercus stellata Wangenheim, Beytr. . . . Nordamer. Holzk., p. 78, pl. 6, 1787.—Emerson, Trees of Mass., pl. 3.—Houba, Chênes Amér. en Belg., p. 265, pl. — Lewis, Trees of Texas, f. 9, 19.—Deam, Rept. Ind. Bd. Forestry, vol. 11, p. 179, pl. 45.—Gray, Manual, 7 ed., f. 671.—Pammel, Trans. Iowa Hort. Soc., vol. 51, p. 96, pl. —Britton & Shafer, N. A. Trees, f. 300.—Trelease, Winter Botany, p. 30, f. 16.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 22.

Q. alba minor Marshall, Arbust. Amer., p. 120, 1785.

Q. villosa Walter, Fl. Carol., p. 235, 1788.

Q. lobulata Solander in Smith & Abbot, Insects of Ga., vol. 1, p. 93, pl. 47, 1797.

Q. obtusiloba Michaux, Hist. Chênes Amér., pl. 1, 1801.—Michaux, f., Hist. Arb. Amér., vol. 2, pl. 4; N. A. Sylva, vol. 1, pl. 5.—Brendel, Trans. Ill. Agr. Soc., vol. 3, pl. 2.—Liebmann-Oersted, Chênes Amér. Trop., pl. H, 33.—Vasey, Amer. Entomol. & Bot., vol. 2, p. 250, f. 158.

Q. Drummondii Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl. 1854. p. 170. —A. de Candolle, in de Candolle, Prodromus. vol. 16, part 2, p. 24.

Q. stellata floridana A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 22, (*Q. floridana* Shuttleworth in herb.)

Q. minor Sargent, Gard. & For., vol. 2, p. 471, 1889; Silva, vol. 8 pl. 368-9; Manual, f. 215.—Hough, Handbook, p. 166, ff.—Emerson & Weed, Our Trees, p. 138, pl. —Cobb, Proc. Am. Phil. Soc., vol. 54, pl. 4.

Throughout the Atlantic region of the United States, from Massachusetts to Florida, Texas, and Kansas; the prototype from Pennsylvania.—Called post oak, usually.

The post oak comprises a large range of foliage forms of which the limits seem scarcely definable. New growth is apt to bear more elongated leaves with narrower lobes than the normal growth of the season. As with many other species, von Ettingshausen and Krašan (Denkschr. k. k. Akad. Wien, vol. 56, p. 63, pl. 15, 1889) indicate for this a forma *heterophylla*. The remarkable forma **Sterretti,** here named for its discoverer, Mr. W. D. Sterrett, of the United States Forest Service, bears an extreme of this attenuated form of foliage, but its type (Natchez, Miss., *Sterrett, 15*) is said not to be heterophyllous. Of the synonyms united above, var. *Drummondii* refers to a southern form with narrower sinuses than usual in its rather broader leaves; and var. *floridana*, to a southern form with more acute or acutely truncate lobes than usual; but neither form appears to be geographically limited.

Professor Sargent (Bot. Gazette, vol. 65, p. 436–442, 1918) has differentiated recently the varieties or forms called *anomala, attenuata, Palmeri, paludosa* (*Q. Margaretta paludosa* Ashe, Journ., Elisha Mitchell Sci. Soc., vol. 34, p. 137, 1918), *parviloba* and *rufescens*. Those which are given new names here are sufficiently differentiated for the present purpose in the key; they are f. **Houbae** (*Q. obtusiloba* Houba, Chênes Amér., facing p. 267); f. **oblonga,** a broader-leaved form of *attenuata*, approaching the typical outline of the species (Little Rock, Ark., *Sterrett, 8*, etc.); f. **tonsa** with glabrescent twigs (Rayville, La., *Sterrett, 8*, etc.); f. **laevis,** differing from the type chiefly in having the leaves quite smooth to the touch above (Auburn, Ala., *Peltier, 19*, the type), though sometimes varying into nearly elliptical and unlobed (Calhoun, La., *Coll. Agric. Exper. Sta.*); f. **mollissima,** a woolly-stellate rather narrowly and deeply lobed form of *reducta* rather than of the type (Trinity River, Texas, *Sterrett, 6*); f. **quadrata,** an aberrant of the type with enormously dilated subquadrate middle lobes (Chapel Hill, N. C., *Totten*, Oct. 8, 1916); f. **reducta,** the common Texan form, except in the southeast, where it passes into the type, from which it differs chiefly in its much smaller leaves (College Station, Texas, *Farr, 6*); and f. **cruciformis,** a modification of this with small leaves otherwise much like those of *quadrata* (Lacey's Ranch, Texas, *Lacey*).

The following species of Rafinesque's Alsographia Americana, 1838, appear to be of this assemblage, but no types are known to have been preserved and I do not place them.—*Q. dilatata*, p. 24; *Q. ferruginea*, p. 20; *Q. fusca*, p. 19; *Q. gonoloba*, p. 25; *Q. heteroloba*, p. 25; and *Q. pandurata*, p. 21—this suggestive of *Q. Margaretta*.

A cross with *Q. lyrata* is ×*Q. Sterretti*. A sinuately 7 or 9-lobed form appears to represent a cross with *Q. bicolor* and may be called ×**Q. substellata** (Toms River, N. J., *Percy Wilson*, July, 1916). What appears to be a cross with *Q. Margaretta*, but possibly includes all of the Texan material that has passed for *Margaretta* of which it has the glabrous twigs and woolly leaf-pubescence, though its twigs and buds are colored as in *stellata*, may be known as ×*Q.* **pseudomargaretta** (Houston, Texas., *Fisher, 5116*, the type). A cross with *macrocarpa* is ×*Q. guadalupensis* Sargent, Bot. Gaz., vol. 65, p. 454, 1918; and a reputed hybrid with *alba* is ×*Q. Fernowi* Trelease, Proc. Amer. Phil. Soc., vol. 56, p. 49, 1917.

QUERCUS MARGARETTA Ashe.

Plate 176.

†*Quercus pandurata* Rafinesque, Alsog. Amer., p. 21, 1838.—Not Humboldt & Bonpland, Plant. Aequin., 1809.
Q. minor Margaretta Ashe, Journ. Elisha Mitch. Sci. Soc., vol. 11, p. 94, 1894.
Q. Margaretta Ashe in Small, Fl. S. E. U. S., p. 355, 1903.—Britton & Shafer, N. A. Trees, f. 299.
Q. stellata Margaretta Sargent, Trees & Shrubs, vol. 2, p. 219, pl. 185, 1913.

Southeastern Atlantic region of the United States, from Virginia to Florida and apparently reaching Oklahoma through Texas; the type from eastern North Carolina.

The leaves are typically very glossy above. An Alabama form with dull leaves, as in *Q. alba* (*Peltier*, 1916), may be designated f. **Peltieri.** The bushy "runner oak" of Alabama and Oklahoma is *Q. stellata Margaretta stolonifera* Sargent, Bot. Gazette, vol. 65, p. 441, 1918, or *Q. Margaretta stolonifera* Ashe, Journ. Elisha Mitchell Sci. Soc., vol. 34, p. 137, 1918. *Q. Margaretta araniosa* Ashe, *l. c.* (*Q. stellata araniosa* Sargent, *l. c.*) is scarcely separable from the type except in its scaly bark. With multiform leaves, as large as in ordinary *stellata*, it is f. **intermedia** (Sanford, Fla., *Rapp. 22*).

What is taken for a cross of *Margaretta* and *geminata* is ×*Q. Harbisonii* Sargent, Bot. Gaz., vol. 65, p. 458, 1918; and ×*Q.* **pseudomargaretta** is the name here proposed for what is taken for a hybrid between *stellata* and *Margaretta*, though it may claim specific rank.

The opinion is expressed in the seventh edition of Gray's Manual that *Q. Margaretta* itself may be a cross between *alba* and *stellata*.

QUERCUS BOYNTONI Beadle.

Plate 176.

Quercus Boyntoni Beadle, Biltmore Bot. Studies, no. 1, p. 47, 1901.
Q. stellata Boyntonii Sargent, Bot. Gazette, vol. 65, p. 437, 1918.

Southeastern Atlantic region of the United States, so far as known confined to the interior of Alabama; the type from Lookout Mountain, near Gadsden.

QUERCUS CHAPMANI Sargent.

Plate 176.

Quercus Chapmani Sargent, Gard. & For., vol. 8, p. 93, 1895; Silva, vol. 8, pl. 370; Manual, f. 216.—Britton & Shafer, N. A. Trees, f. 282.—Berry, Prof. Paper U. S. Geol. Surv., no. 98, pl. 11.
Q. obtusiloba parvifolia Chapman, Fl. S. St., p. 423, 1860.

Southeastern Atlantic region of the United States, near the coast; the prototype doubtless from Apalachicola, Florida.

LYRATAE.—Trees with moderately slender glabrescent twigs, roundish glabrate buds, deciduous stipules, large obovate pinnatifid moderately petioled venulose leaves glabrate above and typically silvery-tomentulose beneath, and annual stalked rather large fruit with typically subincluded acorn and thick-based cup with appressed gray scales.—Atlantic region of the United States.

Subevergreen; acorn long-exserted.....×*Q. Comptonae.*
Deciduous; acorn nearly included in the cup.
Twigs glabrescent: leaves typically lyrate, usually subacute, with mostly entire often acute lobes.
Leaves silvery beneath.....*Q. lyrata.*
Leaves green beneath.....f. *viridis.*
Twigs and leaves somewhat soft-stellate: leaves obtuse, often subcruciform.....×*Q. Sterretti.*

QUERCUS LYRATA Walter.

Plate 183.

Quercus lyrata Walter, Fl. Carol., p. 235, 1758.—Michaux, Hist. Chênes Amér., pl. 4.—Michaux, f., Hist. Arb. Amér., vol. 2, pl. 5; N. A. Sylva, vol. 1, pl. 6.—Wesmael, Bull. Féd. Soc. Hort. Belg., 1869, pl. 1.—Houba, Chênes Amér. en. Belg., p. 273. pl.—Dippel, Handbuch Laubholzk., vol. 2, p. 78, f. 31.—Sargent, Silva, vol. 8, pl. 374; Manual, f. 218.—Britton & Shafer, N. A. Trees, f. 292.—Hough, Handbook, p. 170, ff.—Deam, Rept. Ind. Bd. Forestry, vol. 11, p. 181, pl. 46.—Lewis, Trees of Texas, f. 11.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 19.
Scolodrys lyrata Rafinesque, Alsogr. Amer., p. 29, 1838.

Southern Atlantic region of the United States, from Maryland to Georgia, Texas, Missouri, and Illinois; the type doubtless from the Carolinas; fossil in Pleistocene deposits.—The overcup oak, swamp post oak, or water white oak.

An apparent cross with *Q. stellata*, to which and *alba* it approaches in foliage, with rather persistent soft stellate pubescence and 3- to 5-lobed leaves with the lobes rounded or the larger retuse, may be called ×*Q.* **Sterretti,** Little Rock, Arkansas (*Sterrett, 6*, July 8, 1917).

The most remarkable hybrid oak thus far known is ×*Q. Comptonae* Sargent, Bot. Gazette, vol. 65, p. 456, 1918—a spontaneous cross attributed to *lyrata* ×*virginiana*, and also artificially produced by Ness (Journal of Heredity, vol. 9, p. 263–268, f. 6–8, 1918) with *lyrata* as male and *virginiana* as female parent.

MACROCARPAE.—Typically rather large rough-barked rugged trees with moderately stout at first pubescent sometimes corky-ridged twigs, ovoid or broadly conical buds, often persistent stipules, mostly large obovate often lyrate moderately petioled venulose leaves glabrate above but softly tomentose beneath, and annual stalked typically large fruit with thin loose-tipped characteristically long-attenuate gray scales.—Atlantic region of the United States.

Buds tomentulose; stipules persistent; bark not exfoliating.
- Leaves round-obovate, rounded at base ..... *Q. macrocarpa orbiculata.*
- Leaves elongated, usually cuneate.
  - Trees.
    - Acorn ovoid, large (25–30 mm.).
      - Cups with very long spreading fringe ..... *Q. macrocarpa muscosa.*
      - Cups with moderate fringe.
        - Fringe incurved ..... *Q. macrocarpa monstrosa.*
        - Fringe not incurved ..... *Q. macrocarpa.*
      - Cups with short fringe.
        - Leaves gray beneath ..... ×*Q. Schuettei.*
        - Leaves white beneath ..... ×*Q. Hillii.*
    - Acorn oblong.
      - Acorn rather large.
        - Fringe long.
          - Cups very shallow saucer-shaped ..... *Q. macrocarpa explanata.*
          - Cups deep.
            - Scales of fringe incurved ..... *Q. macrocarpa Fisherii.*
            - Scales of fringe not incurved ..... *Q. macrocarpa olivaeformis.*
        - Fringe short or lacking ..... ×*Q. Bebbiana.*
      - Acorn small.
        - Fringe of cup short but evident ..... *Q. macrocarpa abbreviata.*
        - Fringe nearly or quite lacking ..... *Q. macrocarpa minor.*
  - Shrubs.
    - Buds spreading; fruit moderate ..... *Q. macrocarpa depressa.*
    - Buds closely appressed: fruit small ..... *Q. macrocarpa appressa.*

Buds glabrous: stipules mostly falling; bark of branches exfoliating.
- Leaves white beneath ..... *Q. bicolor.*
- Leaves green but softly downy beneath ..... *Q. bicolor mollis.*

QUERCUS MACROCARPA Michaux.

Plates 2, 184 and 185.

Quercus macrocarpa Michaux, Hist. Chênes Amér., pl. 2–3, 1801.—Michaux, f., Hist. Arb. Amér., vol. 2, pl. 3; N. A. Sylva, vol. 1, pl. 4.—Torrey, Fl. N. Y., vol. 2, pl. 108.—Emerson, Trees Mass., pl. 2.—Mouillefert, Traité des Arbres, pl. 113.—Sargent, Silva, vol. 8, pl. 371–3; Manual, f. 217.—Brendel, Trans. Ill. Agr. Soc., vol. 3, pl. 5.—Liebmann-Oersted, Chênes Amér. Trop., pl. G, 33.—Wesmael, Bull. Féd. Soc. Hort. Belg., 1869, pl. 2.—James, Journ. Cincinnati Soc. Nat. Hist., vol. 4, p. 1, pl.—Vasey, Amer. Entomol. & Bot., vol. 2, p. 250, f. 157.—Houba, Chênes Amér. en Belg., p. 269, pl.—Britton & Shafer, N. A. Trees, f. 291.—Gray, Manual, 7 ed., f. 673.—Hough, Handbook, p. 168, ff.—Emerson & Weed, Our Trees, p. 141, pl.—Clements *et al.*, Minn. Trees & Shr., p. 265, f.—Deam, Rept. Ind. Bd. Forestry, vol. 11, p. 183, pl. 47.—Otis, Mich. Trees, p. 102, f.—Garman, Woody Pl. of Kentucky, f. 6–8.—Burns & Otis, Trees of Vermont, p. 117, f.—Lewis, Trees of Texas, f. 10.—Rowlee & Nichols, Bot. Gaz., vol. 29, p. 355, f. 5.—Pammel, Trans. Iowa Hort. Soc., vol. 51, p. 96. pl.—Cobb, Proc. Am. Philos. Soc., vol. 54, pl. 5.—Trelease, Proc. Amer. Philos. Soc., vol. 54, pl. 1; Winter Botany, p. 30, f. 15.—Schneider, Ill. Handb., vol. 1, p. 201, f. 127.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 20.

Cerris macrocarpa Rafinesque, Alsographia Americana, p. 29, 1838.

C. dulcis Rafinesque, *l. c.*

Atlantic region of Canada and the United States extending southward from New Brunswick and Maine to Pennsylvania, Kentucky, Mississippi, and Texas, and northwestward to the Saskatchewan; the type apparently from Nashville, Tenn.; fossil in Pleistocene deposits.—The bur oak, mossy-cup oak, or mossy-overcup oak.

With short-fringed cups it is f. *abbreviata* A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 20, 1864. With greatly elongated fruit it is f. *olivaeformis* Gray, Manual, ed. 2, p. 404, 1856 (*Q. olivaeformis* Michaux, f., Hist. Arb. Amér., pl. 2, 1812; N. A. Sylva, vol. 1, pl. 3.—Loudon, Arbor. Brit., vol. 3, f. 1730.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 20.—*Cerris olivaeformis* Rafinesque, Alsog. Amer., p. 29, 1838). With small, nearly or quite fringeless fruit (Trelease, Proc. Amer. Philos. Soc., vol. 54, pl. 1) it is f. *minor* A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 20, 1864. In the Missouri River region and farther north it fruits as a shrub, f. **depressa** (*Q. obtusiloba depressa* Nuttall, Gen., vol. 2, p. 245, 1818.—*Q. stellata depressa* A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 22, 1864); the extreme of this, in Saskatchewan, with appressed buds, is f. **appressa**.

A hybrid with *Q. alba* (Sargent, Silva, vol. 8, pl. 360) is ×*Q. Bebbiana* Schneider, Handb., vol. 1, p. 201, 1894; a supposed hybrid between *macrocarpa* and *Muehlenbergii* (Sargent, *l. c.*, p. 56) is ×*Q. Hillii* Trelease, Proc. Amer. Philos. Soc., vol. 56, p. 49, 1917; and a cross with *bicolor* is ×*Q. Schuettei* Trelease, *l. c.*, p. 51, pl. 2, 3 (*Q. macrocarpa*×*platanoides* Alexander, Rept. Mich. Acad., vol. 6, p. 88, 1904). Possibly it is this latter which is called *Q. hybrida Kentonii* by Hampton in Ann. Rept. Ohio. St. Bur. For., vol. 1, p. 194, 1886. A supposed hybrid of *macrocarpa* with *Prinus* (*Q. Michauxii*×*macrocarpa* Sudworth, U. S. Dep. Agr., Div. For., Bull. no. 14, p. 158, 1897, from Covington, Tenn.) is ×**Q. Byarsi** Sudworth *in litt.*

Two very similar supposed hybrids of *macrocarpa* with large fruit but foliage resembling that of the Rocky Mountain group Gambelieae are ×*Q. Andrewsii* Sargent (Bot. Gaz., vol. 65, p. 455, 1918), of Oklahoma, one parent of which is believed to be *Q. Fremontii*—reported under the name *undulata;* and ×*Q. guadalupensis* Sargent (*l. c.*, p. 454), of Texas, one parent of which is taken to be *Q. stellata.*

The great variability of the bur oak in Hardin County, Ohio, is noted by Hampton, who suggests that the many forms occur probably from crossing with other oaks. It is more possible than probable that one or more of these may belong under ×*Q. Schuettei.* Names are given by him to var. *Fisherii* with large olive-shaped acorns, the long scales of the cups incurved; var. *monstrosa* with large oblong-ovate acorns, and similarly incurved scales in some cases; var. *muscosa* with very large ovoid acorns and shallow cups with wide-spreading long fringe; and var. *MacClarenii* "that partakes largely of *Q. bicolor* in the shape of its acorns, which are two-thirds inclosed in the cup."

The name *macrocarpa* is applied specifically to a segregate of the European *Q. pedunculata* by de Morogues, Mém. Soc. Agr., etc., d'Orléans, vol. 50, p. 50, 1877.

QUERCUS BICOLOR Willdenow.

Plate 186.

Quercus bicolor Willdenow in Mühlenberg, Neue Schr. Ges. Nat. Fr. Berlin, vol. 3, p. 396, 1801.—Emerson, Trees of Mass., pl. 4.—Vasey, Amer. Entomol. & Bot., vol. 2, p. 280, f. 172.—Houba, Chênes Amér. en Belg., p. 275, pl.—Clements *et al.*, Minn. Trees & Shr., p. 264, f.—Gray, Manual, 7 ed., f. 674.—Deam, Rept. Ind. Bd. For., vol. 11, p. 185, pl. 48.—Britton & Shafer, N. A. Trees, f. 289–290.—Otis, Mich. Trees, p. 104, f.—Cobb, Proc. Am. Philos. Soc., vol. 54, pl. 5.—Trelease, Winter Botany, p. 30, f. 12.—Burns & Otis, Trees of Vt., p. 119, pl.—Pammel, Trans. Iowa Hort. Soc., vol. 51, p. 96.—Garman, Woody Pl. of Kentucky, f. 9.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 20.

Q. Prinus platanoides Lamarck, Encyl., vol. 1, p. 720, 1783.

Q. alba palustris Marshall, Arbust. Amer., p. 120, 1785.

Q. Prinus tomentosa Michaux, Hist. Chênes Amér., pl. 9, 1801.—Loudon, Arbor. Brit., vol. 3, f. 1739.

Q. Prinus discolor Michaux, f., Hist. Arb. Amér., vol. 2, p. 46, pl. 6, 1812; N. A. Sylva, vol. 1, pl. 7.—Brendel, Trans. Ill. Agr. Soc., vol. 3, pl. 3.

Q. Prinus bicolor Spach, Hist. Vég., vol. 11, p. 158, 1842.

Q. bicolor platanoides A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 21, 1864.

Q. paludosa Petzold, Arbor. Muscav., p. 646, 1864.

Q. bicolor angustifolia Dippel, Handb., vol. 2, p. 87, 1892.

Q. bicolor cuneiformis Dippel, *l. c.*
Q. bicolor lyrata Dippel, *l. c.*
Q. discolor bicolor Hampton, Rept. Ohio St. Bur. For., vol. 1, p. 195, 1886.
Q. platanoides Sudworth, Rept. U. S. Sec. Agric., 1892, p. 327 (1893).—Sargent, Silva, vol. 8, pl. 380, 381; Manual, f. 219.—Hough, Handbook, p. 172, ff.—Emerson & Weed, Our Trees, p. 142, pl.—Rowlee & Nichols, Bot. Gaz., vol. 29, p. 354, f. 3.

Atlantic region of Canada and the United States, from Ontario to Maryland, Missouri and Wisconsin; the type probably from Pennsylvania; fossil in Pleistocene deposits.—The swamp white oak or blue oak.

A swampy woodland form with the leaves green and sparsely soft-pubescent or glabrate is var. *mollis* Nuttall, Genera, vol. 2, p. 215, 1818.—*Q. mollis* Rafinesque, Alsog. Amer., p. 22, 1838.—*Q. pannosa* Bosc in Steudel, Nomencl., ed. 2, p. 427, 1841, as synonym of *Q. Michauxii*.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 24.—*Q. filiformis* Miihlenberg, Cat. p. 91, 1818, name only.

A hybrid with *Q. alba* is ×*Q. Jackiana* Schneider (Handb., vol. 1, p. 202, 1904.—Knowlton and Deane, Rhodora, vol. 16, p. 113, 1914); a cross with *Q. macrocarpa* is ×*Q. Schuettei* Trelease, Proc. Amer. Philos. Soc., vol. 56, p. 51, pl. 2, 3; and one with *Q. stellata* (Ocean Grove, N. J., *Wilson*, 1916) may be called ×*Q.* **substellata.**

PRINOIDEAE.—Usually trees, often of large size, with rather slender usually glabrous twigs, conical buds, deciduous stipules, moderate or mostly large lanceolate or usually obovate serrate moderately petioled venulose leaves glabrous above but often tomentulose beneath, and annual short-stalked moderate or rather large fruit with thin appressed gray scales. Atlantic region of the United States.[8]

Subevergreen.....×*Q. Comptonae.*
Promptly deciduous.
  Leaves rather deeply obliquely lobed.....*Q. alba Ryderi.*
  Leaves only moderately lobed.
    Obovate.....×*Q. Deami.*
    Oblanceolate.
      Lobes about 7 on a side.....×*Q. Beadlei.*
      Lobes about 5 on a side.....×*Q. Fernowi.*
  Leaves deeply toothed rather than lobed.
    Trees.
      Toothing subrepand; southwestern.....*Q. Brayi.*
      Toothing crenate or dentate or serrate.
        Teeth mucronulate.
          Leaves large, broadly obovate.
            Cup large with coarse loose scales; swamps.
              Leaves pale beneath.....*Q. Prinus.*
              Leaves green beneath.....f. *viridis.*
            Cup rather small with fine scales; uplands.....*Q. Muehlenbergii* f. *Alexanderi.*
          Leaves mostly smaller, lanceolate or oblanceolate; fruit rather small; cup with fine loose scales; uplands.
            Twigs glabrous.....*Q. Muehlenbergii.*
            Twigs yellow-scurfy.....f. *stellulata.*
        Teeth not mucronulate; cup with adnate scales.
          Leaves auricled.....×*Q. Sargentii.*
          Leaves not auricled.....*Q. montana.*
    Shrubs; leaves lanceolate to obovate.....*Q. prinoides.*

QUERCUS BRAYI Small.

Quercus Brayi Small, Bull. Torrey Bot. Cl., vol. 28, p. 558, 1901.—Britton & Shafer, N. A. Trees, f. 287.
Q. Muehlenbergii Brayi Sargent, Bot. Gazette, vol. 65, p. 442, 1918.
Q. Muehlenbergii Auct., as to western Texas and New Mexico—*e. g.*, Wooton, Contr. U. S. Nat. Herb., vol. 19, p. 171, 1915.

Southwestern Atlantic and adjacent Rocky Mountain regions, in Texas and New Mexico; the type from Kerrville, Texas.—Called chestnut oak.

[8] The following names from Rafinesque's Alsographia Americana, 1838, refer to species of this group, but are not readily placeable: *Q. carpinifolia*, p. 21, Virginia; *Q. granulata*, p. 21, Arkansas and Texas; *Q. longifolia*, p. 21, Allegheny Mountains; *Q. versicolor*, p. 20, Carolina to Florida.

QUERCUS PRINUS Linnaeus.

Plate 187.

Quercus Prinus Linnaeus, Sp. Pl., vol. 2, p. 996, 1753.—Sargent, Rhodora, vol. 17, p. 40, 1915.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 21.

Q. Prinus (*palustris*) Michaux, Hist. Chênes Amér., pl. 6. 1801.—Michaux, f., Hist. Arb. Amér., vol. 2, pl. 7; N. A. Sylva, vol. 1, pl. 8.—Loudon, Arb. Brit., vol. 3, pl., and f. 1735.

Q. Michauxii Nuttall, Genera, vol. 2, p. 215, 1818—Sargent, Silva, vol. 8, pl. 382-3; Manual, f. 220. Gray, Manual, 7 ed., f. 675—Britton & Shafer, N. A. Trees, f. 288.—Hough, Handbook, p. 174, ff.—Deam, Rept. Ind. Bd. Forestry, vol. 11, p. 187, pl. 49.—Lewis, Trees of Texas, f. 12, 24.

Southern Atlantic region of the United States from Delaware to Florida, Mississippi, Texas, Missouri, Tennessee, and southern Indiana; the type from the Carolinas; fossil in Pleistocene deposits.—Called cow oak, basket oak, or swamp chestnut oak.

Like *lyrata* and other species normally white-tomentulose beneath, this occurs in a form with the leaves green on both faces, f. **viridis.** A reputed hybrid with *Q. alba* is ×*Q. Beadlei* Trelease, Proc. Am. Philos. Soc., vol. 56, p. 48, 1917; and a supposed hybrid with *Q. macrocarpa* is ×**Q. Byarsi** Sudworth *in litt.*

QUERCUS MONTANA Willdenow.

Plate 187.

Quercus montana Willdenow, Sp. Pl., vol. 4, part 1, p. 440, 1805.—Nouveau Duhamel, vol. 7, pl. 47.—Emerson, Trees Mass., pl. 6.—Sargent, Rhodora, vol. 17, p. 40, 1915.

Q. Prinus of most writers: *e. g.*, Du Roi, Harbk. Baumz., vol. 2, pl. 2.—Wangenheim, Beitr. Nordamer, Holzk., pl. 4.—Smith & Abbot, Insects of Ga., vol. 2, pl. 82.—Audubon, Birds, pl. 50, 131.—Houba, Chênes Amér. en Belg., p. 279, pl.—Sargent, Silva, vol. 8, pl. 375-6; Manual, f. 221.—Gray, Manual, 7 ed., f. 678.—Britton & Shafer, N. A. Trees, f. 286.—Hough, Handbook, p. 176, ff.—Emerson & Weed, Our Trees, p. 145, pl.—Burns & Otis, Trees of Vermont, p. 123, pl.—Deam, Rept. Ind. Bd. Forestry, vol. 11, p. 188, pl. 50.—Rowlee & Nichols, Bot. Gaz., vol. 29, p. 354, f. 4.—Cobb, Proc. Am. Phil. Soc., vol. 54. pl. 5.

Q. Prinus monticola Michaux, Hist. Chênes Amér., pl. 7, 1801.—Michaux, f., Hist. Arb. Amér., vol. 2, pl. 8; N. A. Sylva, vol. 1, pl. 9.—Wesmael, Bull. Féd. Soc. Hort. Belg., 1869, pl. 4.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2., p. 21.

Q. monticola Petzold & Kirchner, Arbor. Muscav., p. 644, 1864.

Atlantic region of the United States, through the Apalachians from Massachusetts to Alabama, Kentucky, Ohio, and Indiana; the Willdenovian types from Virginia and the high Carolina mountains. The rock chestnut oak, rock oak, mountain oak, or tanbark oak.

A hybrid with *Q. alba* (Vasey, Bull. Torr. Bot. Cl., vol. 10, pl. 28.—Sargent, Silva, vol. 8, pl. 361) is ×*Q. Saulii* Schneider, Handb., vol. 1, p. 203, 1904.—See also ×*Q. Sargentii*.

QUERCUS MUEHLENBERGII Engelmann.

Plate 187.

Quercus Muehlenbergii Engelmann, Trans. Acad. St. Louis, vol. 3, p. 391, 1877.—Britton & Shafer, N. A. Trees, f. 284.—Gray, Manual, 7 ed., f. 676.—Deam, Rept. Ind. Bd. For., vol. 11, p. 190, pl. 51.—Garman, Woody Pl. of Kentucky, f. 6.—Otis, Mich. Trees, p. 106, f.—Burns & Otis, Trees of Vermont, p. 121, pl.—Trelease, Winter Botany, p. 30, f. 18.—Elliott, Kansas Univ. Sci. Bull., vol. 9, pl. 8, etc.

Q. Prinus acuminata Michaux, Hist. Chênes Amér., pl. 8., 1801.—Michaux, f., Hist. Arb. Amér., vol. 2, pl. 9; N. A. Sylva, vol. 1, pl. 10.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 21.

Q. castanea Willdenow in Mühlenberg, Neue Schr. Ges. Naturf. Fr. Berlin, vol. 3, p. 396. 1801.—Brendel, Trans. Ill. Agr. Soc., vol. 3, pl. 4.—Vasey, Amer. Entomol. & Bot., vol. 2, p. 281, f. 173.—Dippel, Handb. Laubholzk., vol. 2, p. 86, f. 36.—Not. *Q. castanea* Née, apparently published earlier in 1801.

Q. castanea macrophylla Hampton, Rept. Ohio St. For. Bur., vol. 1, p. 195, 1886.

Q. acuminata Sargent, Gard. & For., vol. 8, p. 93, 1895; Silva, vol. 8, pl. 377; Manual, f. 222.—Hough, Handbook, p. 78, ff.—Pammel, Trans. Iowa Hort. Soc., vol. 51, p. 96, 2 pl.—Rowlee & Nichols, Bot. Gaz., vol. 29, p. 354, f. 1.

Atlantic region of the United States from Maine to Georgia, Texas, Kansas, and Wisconsin; the Michauxian prototype from the United States, west of the Allegheny Mountains. The name is commonly spelled *Muhlenbergii* through disregard of Engelmann's spelling with the umlaut (ü). Fossil in Pleistocene deposits (and probably including the Pleistocene wood named *Q. Marcyana*).—Called yellow oak, chinquapin oak, rock oak, etc.

This hybridizes with *Q. macrocarpa* (Sargent, Silva, vol. 8, p. 56.— Hitchcock, Bot. Gaz., vol. 18, p. 110, pl. 8), ×*Q. Hillii* Trelease, Proc. Am. Philos. Soc., vol. 56, p. 49, 1917; and with *Q. alba* (Deam, Rept. Ind. Bd. For., vol. 11, p. 177, pl. 44), ×*Q. Deami* Trelease, *l. c.*

The more obovate of the many leaf-forms is f. **Alexanderi** (*Q. Alexanderi* Britton, Manual Fl. N. St. & Canada, p. 336, 1901.—Britton & Shafer, N. A. Trees, p. 328, f. 285.—*Q. acuminata Alexanderi* Farwell, Rep. Mich. Acad. Sci., vol. 6, p. 206, 1904).

QUERCUS PRINOIDES Willdenow.

Plate 187.

Quercus prinoides Willdenow in Mühlenberg, Neue Schr. Ges. Naturf. Fr. Berlin, vol. 3, p. 397; 1801.—Torrey, Fl. N. Y., vol. 2, pl. 109.—Vasey, Amer. Entomol. & Bot., vol. 2, p. 281, f. 174.—Dippel, Handb. Laubholzk., vol. 2, p. 83, f. 34.—Sargent, Silva, vol. 8, pl. 378.—Britton & Shafer, N. A. Trees, f. 283.—Emerson & Weed, Our Trees, p. 146, pl.—Clements *et al.*, Minn. Trees & Shr., p. 264, f.—Gray, Manual, 7 ed., f. 677.

Q. Prinus humilis Marshall, Arbust. Amer., p. 125, 1785.

Q. Prinus pumila Michaux, Hist. Chênes Amér., pl. 9, 1801.

Q. Prinus Chincapin Michaux, f., Hist. Arb. Amér., vol. 2, p. 64, pl. 10, 1812; N. A. Sylva, vol. 1, pl. 11.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 21.

Q. Chinquapin Pursh, Fl. Am. Sept., vol. 2, p. 634, 1814.—Emerson, Trees Mass., ed. 2, vol. 1, p. 158, pl.

Q. Chincapin Rafinesque, Alsog. Amer., p. 23, 1838.

Q. Muhlenbergii humilis Britton, Bull. Torr. Bot. Cl., vol. 13, p. 41, 1886.

Atlantic region of the United States from Vermont to South Carolina, Missouri and Michigan; the prototype probably from the Carolinas; fossil in Pleistocene deposits.—The dwarf chinquapin oak or scrub chestnut oak.

A form from Nantucket with yellow-pubescent twigs and leaves is var. *rufescens* Rehder, Rhodora, vol. 9, p. 60, 1907.—Britton & Shafer, N. A. Trees, p. 327 (*Q. rufescens* Bicknell, Bull. Torrey Bot. Cl., vol. 45, p. 376, 1918).

A hybrid with *Q. alba* is ×*Q. Faxoni* Trelease, Proc. Am. Philos. Soc., vol. 56, p. 49, 1917.

SADLERIANAE.—Shrubs with moderate fluted glabrate twigs, round-ovoid buds, deciduous stipules, moderate elliptical incurved-serrate petioled leaves glabrous above but more or less pubescent beneath, and annual subsessile fruit with acute more or less keeled appressed brown tomentose scales.—Californian region.

Leaves glossy green, pale beneath.....*Q. Sadleriana.*

QUERCUS SADLERIANA Robert Brown, Campst.

Plate 188.

Quercus Sadleriana Robert Brown, Campst., Ann. & Mag. Nat. Hist., ser. 4, vol. 7, p. 249, 1871.—Sargent, Silva, vol. 8, pl. 379.—Sudworth, Forest Trees Pac. Slope, f. 126.

Californian region, in Oregon and northern California; the type from southern Oregon.—Called deer oak, or bear oak.

DOUGLASIEAE.—Small or moderate-sized trees with slender somewhat villous twigs, ovoid light brown buds, mostly deciduous stipules, rather small more or less dentate or when developed sinuately lobed short-stalked firm elliptical leaves stellate above and rather fleecy beneath, and annual subsessile fruit with elongated acorns and thin appressed brown-tipped canescent scales.—Californian region.

Leaves blue-green.....*Q. Douglasii.*

QUERCUS DOUGLASII Hooker & Arnott.

Plate 188.

Quercus Douglasii Hooker & Arnott, Bot. Beechey, p. 391, 1841.—Nuttall, Sylva, vol. 1, pl. 4.—Liebmann-Oersted, Chênes Amér. Trop., pl. 41.—Green, Ill. W. Amer. Oaks, pl. 9, 12.—Dippel, Handb. Laubholzk., vol. 2, p. 77, f. 30.—Sargent, Silva, vol. 8, pl. 386; Manual, f. 225.—Sudworth, Forest Trees Pac. Slope, f. 127–8.—Britton & Shafer, N. A. Trees, f. 278.—Eastwood, Occ. Papers Calif. Acad., no. 9, pl. 27.—Jepson, Silva Calif., pl. 3, 60, 68.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 23.

Q. Ransomii Kellogg, Proc. Calif. Acad. Sci., vol. 1, p. 25, 1854.

Q. Douglasii Ransomii Beissner, Schelle & Zabel, Handb. Laubholz. Benenn., p. 74, 1903.

Californian region, in the Western Sierras and the Coast Range of California; the type from California.—Called blue oak, rock oak, mountain white oak, hill oak, etc.

What has been taken for a possible hybrid of this with *Q. Garryana* has been reported by Jepson (Pac. Rural Press, vol. 57, p. 9, 1909; Silva Calif., p. 215), but scarcely seems to be more than a form of *Douglasii*. A cross with *Q. lobata* is ×*Q. jolonensis* Sargent, Bot. Gaz. vol. 65, p. 456, 1918. It has been suggested further (Sargent, Silva, vol. 8, p. 79, 1895) that this blue-leaved *Douglasii* may possibly hybridize with the green-leaved *dumosa*.

VIRENTES.—Trees, sometimes large and very spreading, exceptionally shrubs, with slender tomentulose twigs, rounded buds, deciduous stipules, prevailingly elliptical rather small entire or rather exceptionally repandly or serrately few-toothed short-petioled revolute usually little veiny but sometimes pinnately impressed leaves mostly glabrescent above but closely canescent beneath, and annual stalked fruit with thin or keeled appressed pointed canescent scales.—Central in the southern Atlantic region of the United States, reaching through the eastern Sierra Madre and Central American regions; reappearing in the desert region of lower California, and established locally in Cuba.[9]

Trees with broadly elliptical usually obtuse and entire leaves.
- Cup-scales neither keeled nor in distinct vertical rows.
  - Veins of leaves rather inconspicuous. United States.
    - Leaves tomentulose and pale beneath.
      - Leaves moderate (scarcely 2×6 cm).....*Q. virginiana.*
      - Leaves large (3–6×7–10 cm.).....f. *macrophylla.*
      - Leaves glabrate and green beneath.....f. *virescens.*
    - Primary veins impressed above and raised beneath.
      - Of Cuba.....v. *Sagraeana.*
      - Of Florida.....*Q. geminata grandifolia.*
- Cup-scales characteristically somewhat keeled.
  - In distinct vertical rows at maturity. Mexico.....*Q. oleoides.*
  - Not in very evident rows. Central America.....f. *australis.*

Trees with coarsely toothed obovate-cuneate leaves Mexico.....f. *lutescens.*

Trees with variously elliptical, oblong, or obovate leaves, revolute and entire, or toothed or lobed.
Florida.....×*Q. Harbisonii.*

Trees with elliptical-oblong sometimes toothed leaves. Southwestern United States.
- Veins not conspicuous. Texas and Northern Mexico.....*Q. fusiformis.*
- Veins rather raised above. Lower California.....*Q. Brandegei.*

Shrubs or small trees with oblong, oblanceolate, obovate, or elliptical often coarsely toothed leaves. Southeastern United States.
- Veins impressed above and raised beneath.
  - Leaves rather succulent.
    - Moderately small, entire; fruit short-stalked.....*Q. geminata.*
    - Larger (over 2×5 cm.), entire.....f. *grandifolia.*
    - Small (scarcely 1.5×4 cm.).
      - Fruit short-stalked.
        - Leaves entire.....f. *maritima.*
        - Leaves often coarsely few-toothed.....f. *Rolfsii.*
      - Fruit in elongated racemes.....v. *succulenta.*
  - Leaves coriaceous, often coarsely few-toothed.
    - Acorn long-exserted.
      - Leaves rather small, scarcely veiny above.....*Q. minima.*
      - Leaves larger (3×8 cm.), raised-venulose.....f. *Reasoneri.*
    - Acorn nearly included.....f. *pygmaea.*
- Veins rather inconspicuous.
  - Acorn nearly included. Louisiana.....*Q. Andromeda.*
  - Acorn long-exserted. Southern Florida.....f. *nana.*

[9] The following names of Rafinesque's Alsographia Americana, 1838, refer to forms of this group of the Southeastern States (his subgenus Finax), but they are not readily placeable: *Q. cuneifolia*, p. 27; ?*Q. heterophyla*, p. 24 (not *Q. heterophyla* Michaux, f. 1812); *Q. ilexoides*, p. 23; *Q. nitida*, p. 20; *Q. oligodes*, p. 28; *Q. suberoides*, p. 23, this ascribed to his new species, of 1808.

QUERCUS VIRGINIANA Miller.

Plates 189 and 190.

Quercus virginiana Miller, Gard. Dict., 8 ed., no. 16, 1768.—Dippel, Handb. Laubholzk., vol. 2, p. 91, f. 39.—Sargent, Silva, vol. 8, pl. 394–5; Manual, f. 232.—Gray, Manual, 7 ed., f. 679.—Hough, Handbook, p. 180, ff.—Britton & Shafer, N. A. Trees, f. 265–6.—Emerson & Weed, Our Trees, p. 149, pl.—Lewis, Trees of Texas, f. 13.—Trelease, Winter Botany, p. 30, f. 10.

Q. Phellos β Linnaeus, Sp. Pl., vol. 2, p. 994, 1753.

Q. Phellos c Muenchhausen, Hausv., vol. 5, p. 255, 1770.

Q. Phellos obtusifolia Lamarck, Encycl., vol. 1, p. 722, 1783.

Q. Phellos sempervirens Marshall, Arbust. Amer., p. 124, 1785.

Q. sempervirens Walter, Fl. Carol., p. 234, 1788.

Q. virens Aiton, Hort. Kew, vol. 3, p. 356, 1789.—Michaux, Hist. Chênes Amér., pl. 10.—Michaux, f. Hist. Arb. Amér., vol. 2, pl. 11; N. A. Sylva, vol. 1, pl. 12.—Vasey, Amer. Entomol. & Bot., vol. 2, p. 282, f. 175.—Liebmann-Oersted, Chênes Amér. Trop., pl. 33.—Houba, Chênes Amér., en Belg., p. 302, pl.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 37.

?*Q. incana* Bartram, Travels, p. 403. 1791.

Southern Atlantic region of the United States, reappearing in Cuba; the type cultivated in England; fossil in Pleistocene deposits as *Q. virginiana* and, apparently, in the late Pliocene as *Q. previrginiana*.—Called live oak.

A form with glabrous twigs and leaves green and glabrate beneath is var. *virescens* Sargent, Bot. Gaz., vol. 65, p. 446, 1918. A variant of the type, with the leaves pale-pubescent beneath, is var. *macrophylla* Sargent, *l. c.*, p. 447, the large ovate or obovate leaves measuring 3–6 × 7–10 cm.

In the Pinar del Rio region of Cuba (the only part of the West Indies in which *Quercus* is known to occur), an arboreous form of this species, var. **Sagraeana** (*Q. Sagraeana* Nuttall, Sylva, vol. 1, p. 17, 1842.—*Q. cubana* A. Richard, Fl. Cuba, vol. 3, p. 230, 1853), is found which in some instances has the veins pinnately impressed above and prominent beneath, though without apparent constancy of differentials from the large live oak of the Gulf States. Specimens of this have been examined from Herradura (*Britton & Earle, 6580; Earle*, 1907), Pinar del Rio to Viñales (*Britton, Britton & Gager, 7304–5*); Rio Guao (*Britton, Britton & Cowell, 9650, 10108*); Laguna Jovero to Las Martinas (*Shafer, 11035*); Luis Lazo (*O'Donovan, 1000*); Sta. Catalina (*v. Hermann, 813, 3324, 7124*); Puerto de Golpe (*Cook, 15–22*); Los Palacios to S. Pablo de los Yeguas (*Shafer, 11906, 11908, 11910*); Arroyo del Sumidero (*Shafer & Leon, 13676*); Caiguanabo (*Wright, 2292*). Without data further than Cuba (*La Sagra, 418*, no doubt a cotype at once of *Q. Sagraeana* and *Q. cubana; Herb. Jamain*, in the Vienna herbarium; *Marsans*, 1903).

A spontaneous hybrid of the live oak with *Q. lyrata*, which has been produced artificially as well, is ×*Q. Comptonae* Sargent, Bot. Gaz., vol. 65, p. 456, 1918.

QUERCUS OLEOIDES Chamisso and Schlechtendal.

Plates 191 to 194.

Quercus oleoides Chamisso & Schlechtendal, Linnaea, vol. 5, p. 79, 1830.—Liebmann-Oersted, Chênes Amér. Trop., p. 10, f. 9, pl. 43.—Oersted, Bidrag Kundsk. Egefamil., p. 343, f. D, pl. 2, f. 4–8, pl. 6, f. 24.

Q. virens in part A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 37, 1864.

Twigs slender (2 mm.), fluted, like the lower leaf surface minutely but densely rather grayish-tomentose. Buds glabrate, reddish, rounded, scarcely 2 mm. in diameter. Leaves evergreen, at length firm, obovate-elliptical, subacute and often mucronate to obtuse or slightly notched, acute at base or subcuneate, entire or somewhat angled or crenate-serrate with a few low teeth toward the end, slightly crisped, revolute, rather small (3–5 or 6 × 6–8 or 10 or even 8 × 16 cm.), glossy and glabrous above; veins about 8 × 2, forking and looped; petiole tomentose, 1 × 5–10 mm. Catkins: ♂, about 30 mm. long, somewhat short-villous, closely flowered, the minute flowers with pubescent rounded scarcely exserted anthers; ♀, of nearly equal length, 2- or 3-flowered toward the end. Fruit annual, mostly several toward the end of a slender peduncle 2–4 cm. long; cup rather turbinate, deep, moderate (15 mm. in diameter),

with somewhat keeled appressed acute minutely tomentulose scales often in evident vertical ranks; acorn ovoid, 15–20 mm. long, normally about half covered.

Warmer zone of the eastern Sierra Madre region of Mexico, and southward as far as Costa Rica.—A tree 10 to 16 m. high.

Specimens examined.—Mexico. Hacienda de la Laguna (*Schiede, 23*, the type); Malpays de Naulingo (*Schiede*, April, 1829); Mexachica (*Schiede*, Dec., 1828); Mirador (*Liebmann, 3527–8; Nelson, 67, 80; Ross, 591; Sartorius, 1302*); Jalapa (*Galeotti, 98*); Huatusco (*Liebmann, 3535; Purpus*, 1913); Zacuapam (*Purpus, 6166*); Cordoba (*Fink, 0*); Wartenberg, Tantoyuca, Huasteca (*Evrendberg, 346*); Tula to Tampico (*Berlandier, 774, 2194*); Fortin (*?Kerber, 375*); Victoria (*Palmer, 264*); Tampico (*Palmer, 220, 318*); Cartresana (*Liebmann*); Montesinos (*Linden, 24*); Chilotepec (*Linden, 16*); Jaltipam (*Goldman, 727*); Sta. Maria Tlatetla (*Liebmann, 3529*); Rancho de Cabrestris (*Liebmann, 3530*); Trapiche de la Concepcion (*Liebmann, 3538*); Paseo del Correo, Potrero de S. Sebastian (*Liebmann, 3533*); Potrero de Cazadero (*Liebmann, 3531*); Yecoatla (*Liebmann, 3537*); Lacoba, Chinantla (*Liebmann, 3536*); Perez (*Endlich, 453*); Palenque to S. Leandro, Chiapas (*Endlich, 1331*); S. Fernando to Tepititan, Tabasco (*Rovirosa, 1028*); without data (*Schiede, 14; Paul, Duke of Wurtemberg*, 1830; *Karwinski*, 1844).

A juvenile form with obovate-cuneate, coarsely serrate, very short-petioled leaves is f. **lutescens** (*Q. lutescens* Martens & Galeotti, Bull. Acad. Brux., vol. 10, part 2, p. 219, 1843.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 38), represented from Mexico by the following collections: Zacuapam (*Galeotti, 91*, the type); Hacienda de la Laguna (*Schiede*, July, 1829); Cuesta de Pinoleo, intermixed with *Q. castanea* (*?Ehrenberg, 1171*); Yecoatla (*Liebmann*).

With leaves varying from broadly elliptical and obtuse or retuse, to sharply acute at each end, and the finer cup-scales not evidently seriate even at full maturity, the Central American form may be known as var. **australis**: British Honduras. (*Moloney*, Jan., 1896). Guatemala. Without locality (*v. Warscewicz, A, 51, 52*); Gualan (*Deam, 159*); Gualan to Copan (*Pittier, 1789*); El Jute, near Copan (*Pittier, 1818*); Finca Sepacuite (*Cook & Griggs, 318*). Honduras. S. Pedro Sula (*Thieme, 5615*); Comayagua to Sabana Larga (*Niederlein*, Feb., 1898). Costa Rica. Volcan de Barba (*Pittier 773, 2607*, the type; *Oersted, 4*, the type of *Q. retusa* Liebmann, Overs, Dansk. Vidensk. Selsk. Forhandl., 1854, p. 187); Mt. Rincon (*Friedrichsthal, 1219*).

QUERCUS FUSIFORMIS Small.

Plate 195.

Quercus fusiformis Small, Bull. Torr. Bot. Cl., vol. 28, p. 357, 1901.
Q. virginiana fusiformis Sargent, Bot. Gazette, vol. 65, p. 448, 1918.

Twigs slender (2 mm.), little fluted, minutely but densely grayish tomentose. Buds reddish, velvety, rounded, 1 mm. in diameter. Leaves evergreen, narrowly oblong-lanceolate, mucronately acute, rounded at base, entire or exceptionally with 1–3 unsymmetrical teeth, scarcely revolute, small (1×2.5–5 cm.), in the type rather obovately elliptical and twice as wide, glabrous and glossy above, very minutely and closely canescent beneath; veins about 10×2, looped, very fine and indistinct; petiole tomentulose, 3 mm. long. Catkins?. Fruit annual, distributed on a puberulent peduncle about 2×40–60 mm.; cup somewhat turbinately beaker-shaped, small (about 10 mm. in diameter), with thin appressed acute very canescent more or less serially arranged scales; acorn fusiform, glossy brown with paler striae, 20–25 mm. long, covered at the base only.

Eastern Sierra Madre region, on both sides of the international boundary, reaching southward to Saltillo.—A small tree.

Specimens examined.—United States. Texas. Kerrville (*Lacey*, the type). International Boundary. Los Moros (*Bigelow*, Oct. 28, 1850). Mexico. Saltillo, Coahuila (*Palmer, 299*); Monclova, Coahuila (*Palmer, 1274*); "Coahuila and Nuevo Leon" (*Palmer, 2003*)! Mountains about Monterrey, Nuevo Leon (*Gregg, 222; Sargent*, 1887, 1900; *Pringle, 2099, 10224, 11332; Canby, Sargent & Trelease, 227; Trelease, 119*).

QUERCUS BRANDEGEI Goldman.

Plates 196 and 197.

Quercus Brandegei Goldman, Contr. U. S. Nat. Herb., vol. 16, p. 321, 1916.

Twigs slender (scarcely 2 mm.), slightly fluted, minutely but very densely grayish-tomentulose. Buds velvety, brown, subglobose, about 1 mm. in diameter. Leaves evergreen, elliptical-oblong, mucronately acute, rounded or acute at base, entire or irregularly pungently low- and few-toothed, especially above, small (1–1.5×3–6 cm.), glabrous and glossy above, very minutely but densely hoary beneath; veins about 12–15×2, looped, very fine; petiole canescent, scarcely 1×5 mm. Catkins: ♂, 30 mm. long, hairy, loosely flowered, the somewhat hairy anthers little-exserted; ♀, about equally long, several-flowered above. Fruit annual, more or less distributed along a slender peduncle sometimes 55 mm. long; cup goblet-shaped, long-stipitate, rather small (10–15 mm. in diameter), with scarcely thickened appressed ashen scales with darker acute tips; acorn conical, half-included or less.

Desert region of Mexico.—A tree 12–20 m. high.

Specimens examined.—Rancho El Paraiso, near El Triunfo, Sierra de la Laguna (*Nelson & Goldman, 7422*, the type, *7475*, both on Jan. 30, 1906); Pescadero (*Brandegee*, Sept. 20, 1893); Miraflores (*Brandegee*, Mar. 21, 1892; *Eisen & Vaslit*, Oct., 1895); without locality (*Belding, 8*). All in the Cape district of Baja California.

QUERCUS GEMINATA Small.

Plates 198 to 200.

Quercus geminata Small, Bull. Torrey Bot. Cl., vol. 24, p. 438, 1897.—Britton & Shafer, N. A. Trees, f. 267.
Q. virginiana geminata Sargent, Bot. Gaz., vol. 65, p. 445, 1918.

Southern Atlantic region of the United States from North Carolina to Florida and Mississippi; the type from Fort Lauderdale, Florida.

A rather smaller-leaved but otherwise scarcely separable form of this small oak is f. **maritima** (*Q. virens maritima* Chapman, Fl. So. St., p. 421, 1860.—*Q. virginiana maritima* Sargent, Silva, vol. 8, p. 100, 1895). As a tree, with distinctly larger sometimes toothed leaves, it is var. **grandifolia** (*Q. virginiana grandifolia* Sargent, Bot. Gaz., vol. 65, p. 446, 1918).

A series of forms with small usually coarsely few-toothed rather succulent leaves comprise var. **succulenta** (*Q. succulenta* Small, Fl. S. E. U. S., 2 ed., p. 1332, 1913); and its f. **Rolfsii** (*Q. Rolfsii* Small, *l. c.*) which differs chiefly in its elongated ♀ catkins.

×*Q. Harbisonii* Sargent, Bot. Gaz., vol. 65, p. 458, 1918, is taken for a cross of *Q. geminata* with *Q. Margaretta*.

QUERCUS MINIMA Small.

Plates 200 and 201.

Quercus minima Small, Bull. Torrey Bot. Cl., vol. 24, p. 438, 1897.
Q. virens dentata Chapman, Fl. So. St., p. 421, 1860.
Q. virginiana minima Sargent, Silva, vol. 8, p. 101, pl. 396, 1895.
Q. virginiana dentata Sargent, Bot. Gaz., vol. 65, p. 448, 1918.

Southern Atlantic region of the United States in Georgia and Florida; the prototype doubtless from Apalachicola, Florida.

It was perhaps this dwarf oak with toothed leaves which Bartram referred to as *Q. Ilex*, about Cedar Point, Florida. Two somewhat larger-leaved variants occur in Florida: f. **Reasoneri** and f. **pygmaea** (*Q. virginiana pygmaea* Sargent, Bot. Gaz., vol. 65, p. 449, 1918), which scarcely differ except in the nearly included acorn of the latter.

QUERCUS ANDROMEDA Riddell.

Plate 202.

†*Quercus Andromeda* Riddell, New Orleans Med. & Surg. Journ., vol. 9, p. 614, 1853.
Q. virginiana eximea Sargent, Bot. Gaz., vol. 65, p. 447, 1918.

Southern Atlantic region of the United States; the type from Springfield, Louisiana.

A dwarf species with small entire scarcely veiny leaves, of which a form with elongated acorns and turbinate cup is f. **nana** (Dade Co., Florida, Small, Dec., 1916).

Quercus Andromeda Riddell, based on *Carpenter*, Plants of Louisiana, no. *1554*, appears to be one of the Virentes, and may well be this, though at present none of Carpenter's specimens are known to have been preserved, so that the identification can not be verified and the name *Quercus eximea* (Sargent) may be preferred for it.

DUMOSAE.—Mostly shrubs with slender tomentose or glabrate twigs, ovoid brown buds, more or less persistent stipules, typically small entire or variously toothed firm thin leaves venulose and often stellate-punctate above and somewhat persistently tomentulose beneath, and annual mostly short-stalked moderate or exceptionally small fruit with acute appressed rather brown or finally gray thin scales, rather exceptionally thickened at base.—Californian region, extending into the desert.

Leaves strongly bullate or revolute, tough.....*Q. durata.*
Leaves not concave below, brittle.
Not lobed; deciduous.
Rather round-based.
Elliptical- or obovate-oblong.
Entire to coarsely serrate.
Moderate.
Fruit rather large.....*Q. dumosa.*
Fruit small, clustered, peduncled.....f. *microcarpa.*
Small, polymorphous.....f. *diversifolia.*
Pungently repand-dentate.....v. *turbinella.*
Orbicular-oblong, entire or serrate.....f. *Alvordiana.*
Round-elliptic, repand-dentate.
Flat.....f. *berberidifolia.*
Much crisped.....f. *crispata.*
Ovate, ciliate-toothed.....f. *populifolia.*
Cuneate.
Subelliptical, serrate.....v. *acutidens.*
Obovate-oblong, entire or subserrate.....f. *myrtifolia.*
Linear-oblong, entire.....f. *linearis.*
Frequently and deeply lobed; evergreen.....v. *MacDonaldi.*

QUERCUS DURATA Jepson.

Quercus durata Jepson, Fl. Calif., p. 356, 1909; Silva Calif., p. 219, 1910.
Q. dumosa bullata Engelmann, Trans. Acad. St. Louis, vol. 3, p. 393, 1877.
Q. dumosa revoluta Sargent, Gard. & For., vol. 8, p. 93, 1895; Silva, vol. 8, p. 96, pl. 392.

Californian mountains, chiefly northward; the type from the Sta. Lucia Mts. (*Brewer*).—The leather oak.

QUERCUS DUMOSA Nuttall.

Plates 203 to 208.

Quercus dumosa Nuttall, Sylva, vol. 1, p. 7, 1842.—Greene, Ill. W. Amer. Oaks, p. 35, pl. 19.—Sargent, Silva, vol. 8, p. 95, pl. 392-3; Manual, f. 231.—Sudworth, Forest Trees of Pac. Sl., p. 292, f. 131.—Jepson, Silva of Calif. p. 217.

A most polymorphic though localized Pacific coast species, chiefly of the Coast Range of California, but extending onto the near-by islands and below the border; the type from Santa Barbara.—Called scrub oak and usually dwarf, but on Santa Catalina, at least, becoming a tree as much as 7 m. tall.

After a field study which he found as puzzling as Engelmann had found that of the *undulata* assemblage a generation earlier, Sargent (Silva, vol. 8, p. 96) was forced to the conclusion that "half a dozen species or well-marked varieties might be established from as many isolated branches selected from plants of *Quercus dumosa* on Santa Catalina Island, and all their characters might be found on a single plant."

Nominal if scarcely separable Californian forms are: *Q. dumosa* Nuttall, as above; f. **berberidifolia** (*Q. berberidifolia* Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 172.—Liebmann-Oersted, Chênes Amér. Trop. pl. 45.—A. de Candolle in de Candolle, Prodromus,

vol. 16, part 2, p. 36.—*Q. dumosa munita*, Greene, Ill. W. A. Oaks, p. 37, pl. 20, 1889); f. *Alvordiana* Jepson, Silva Calif., p. 218, 1910 (*Q. Alvordiana* Eastwood, Occ. Papers Calif. Acad., no. 9, p. 48, pl. 27, 1905), the brittle-leaf oak, of which the insular form with suborbicular typically coarsely serrate leaves (Sta. Catalina Isl., *Millspaugh, 4582–3*) may be called f. *insularis;* var. *acutidens* Wenzig, Jahrb. Bot. Gart. Berlin, vol. 3, p. 204, 1885 (*Q. acutidens* Torrey, Rep. U. S. & Mex. Bound. Surv., vol. 2, part 1, p. 207, pl. 51, 1859.—*Q. dumosa* Greene, Ill. W. A. Oaks, pl. 18); var. *MacDonaldi*, the island oak (*Q. MacDonaldi* Greene, Ill. W. A. Oaks, p. 25, 73, pl. 34, 1889.—Eastwood, Occ. Papers Calif. Acad., no. 9, pl. 27.—Britton & Shafer, N. A. Trees, p. 337, f. 294.—*Q. MacDonaldi elegantula* Greene, Ill. W. A. Oaks, p. 26, 63, pl. 29, 1889.—*Q. dumosa* Sargent, Silva, vol. 8, p. 96, pl. 393, in part.—*Q. dumosa polycarpa* Greene, Ill. W. A. Oaks, p. 36, 61, pl. 28, 1889).

In the exhaustive Flora of Santa Catalina Island, by Millspaugh and Nuttall (Field Mus. Nat. Hist., Publ. 212, p. 77, 1923), are noted besides the forma *insularis*, a f. *myrtifolia* with oblanceolate to ovate variously margined leaves, and f. *longigemma*, distinguished by its elongated buds, as is a form of *Q. alba*; and the evergreen island oak is kept apart from *dumosa* under the name *Q. Mac Donaldii*.

Specimens from San Diego County, California (*Greene*, June 27, 1889), supposedly of a hybrid of *dumosa* with *Engelmanni*, to which (Ill. W. Amer. Oaks, pl. 29) he referred what he had called *Q. MacDonaldi elegantula*, do not appear to show the influence of the latter parentage. It has been suggested further (Sargent, Silva, vol. 8, p. 79, 1895) that this green-leaved oak may cross with *Q. Douglasii*, which has rather similar but blue foliage.

The forms occurring at or below the boundary between California and Baja California are:

Quercus dumosa diversifolia n. f.

Plates 204 and 205.

Twigs very slender (2 mm.) flexuous, soon glabrous. Leaves deciduous, elliptical-oblong, rounded at both ends, entire to coarsely serrate with revolute sinuses even on the same branch, very small (scarcely 1×2 cm.), glabrous above, more or less evanescently scurfy-tomentulose beneath; veins about 6–8×2, scarcely looped; petiole glabrous, 2–10 mm. long. Flowers and fruit ?.

Specimens examined.—Mexico. Carisso Creek, Lower California (*Brandegee*, Apr. 21, 1893). Associated with it, and differentiable only in its narrow elongated leaves acute at both ends, is a flowering specimen with slender loosely flowered glabrous catkins about 2 cm. long, f. **linearis.** Also from Lower California (*Brandegee*, May 6, 1893) occurs a form with elliptical-ovate leaves 2×4 cm. subciliately denticulate, f. **populifolia.** A more heavily toothed form, comparable with representative *dumosa* but with very small clustered fruit, f. **microcarpa**, occurs at Joppa, near the boundary, (*Orcutt*, Oct. 1882).

QUERCUS DUMOSA TURBINELLA Jepson.

Plate 206.

Quercus dumosa turbinella Jepson, Silva of Calif., p. 218, 1910.
Q. turbinella Greene, Ill. W. A. Oaks, p. 37, pl. 27, 1889.

Twigs slender (2–3 cm.), rigidly spreading, rusty-tomentose. Leaves deciduous, elliptical-oblong, round-based, repandly dentate, small (about 1.5×3 cm.) subglabrous above, stellate-tomentose beneath; veins about 6×2, scarcely looped; petiole scarcely 5 mm. long. Catkins ?. Fruit annual, solitary on penduncles 15–20 mm. long; cup openly turbinate, moderate (12 mm. in diameter), with thin appressed scales; acorn oblong, some 8×25 mm., covered at the base only.

Southern California in the United States, Morongo (*Parish, 1223*); and the mountains of northern Baja California, Mexico, Topo (*Orcutt, 640*), the type (*Dunn*) from 20 or 30 miles below the boundary. A shrub.—Called gray oak.

A derivative of this with very pungently toothed much crisped cordate leaves otherwise resembling f. **berberidifolia,** has been collected in the Tantillas mountains, near the boundary (*Palmer, 29*, 1875), and may be called f. **crispata.**

PROTOBALANUS The Intermediate Oaks.

PROTOBALANUS.

Stamens rather numerous (8–10), with somewhat elongated pointed anthers; staminate flowers sometimes clustered on the catkins; styles short with dilated stigmas; fruit maturing the second season, short-stalked, the shell woolly within; abortive ovules lateral; scales of the cup pointed, rather thick, often very woolly; leaves firm, entire or pungently toothed.

Shrubs or trees of moderate size with gray-brown scaly bark and close hard wood with rather few tyloses, as in Erythrobalanus. Exclusively American: California, reaching into Arizona and through the coastwise islands to Guadalupe.—Intermediate oaks.

CHRYSOLEPIDES.—Rather small or shrubby, with moderately slender scurfy or glabrescent twigs, round-ovoid buds, rather persistent setaceous stipules, round- or ovate-elliptical moderate or small entire to very pungently or subaristately dentate moderately petioled acute firm leaves somewhat scurfy or powdery on both faces or glabrescent, especially above, the upper face with or without raised venulation, and small to large subsolitary and sessile fruit with rather shallow yellow-tomentose cup.—Californian and Pacific regions.

Leaves glabrate; characteristically continental.
- Leaves toothed, or if entire the fruit large.
  - Trees: fruit and foliage usually large ..... *Q. chrysolepis.*
  - Shrubs: fruit and foliage rather small.
    - Twigs flexible: northern ..... f. *nana.*
    - Twigs rigid: southern.
      - Californian ..... *Q. Palmeri.*
      - Arizonian ..... *Q. Wilcoxii.*
  - Leaves entire, very small, as is the fruit ..... *Q. vaccinifolia.*

Leaves tomentose for a time; insular.
- Shaped as in *Q. chrysolepis* ..... *Q. tomentella.*
- Shaped as in *Pasania chrysophylla* ..... f. *conjungens.*

QUERCUS CHRYSOLEPIS Liebmann.

Plates 9, 209, and 210.

Quercus chrysolepis Liebmann, Oversigt Dansk. Vidensk. Selsk. Forhandl. 1854, p. 173.—Liebmann-Oersted, Chênes Amér. Trop., p. 23, pl. 47.—Greene, Ill. W. Am. Oaks, p. 39, pl. 21, 22.—Sargent, Silva, vol. 8, p. 105, pl. 398–9; Manual, f. 209.—Sudworth, Forest Trees of Pac. Sl., f. 132–4.—Dippel, Handb., vol. 2, f. 40.—Britton & Shafer, N. A. Trees, f. 263.—Eastwood, Occ. Papers Calif. Acad., no. 9, pl. 28.—Jepson, Fl. Calif., f. 65; Silva Calif. pl. 69.—A. de Candolle in de Candolle, Prodromus. vol. 16. part 2. p. 37.

Q. fulvescens Kellogg, Proc. Cal. Acad., vol. 1, p. 70, 1855.—Newberry, Pac. R. R. Rep., vol. 6, pt. 3, p. 27, f. 5, 1857.

Q. crassipocula Torrey, Pac. R. R. Rep., vol. 4, pt. 5, p. 137, 1857; vol. 5, p. 365, pl. 9, 1857.

Q. chrysophyllus Kellogg, Proc. Cal. Acad., vol. 1, p. 67. Reprint of 1873.

Mountains of California, reaching into Oregon and Washington. The most ancient existing American oak; supposed to date from mid-Tertiary times in a variety considered to be typically represented in the Pleistocene, and one of the most complicated of the polymorphic species now recognized in the United States.—Called maul oak, iron oak, hickory oak, golden-cup oak, golden-leaf oak, Valparaiso oak, etc.

No effort has been made to segregate its forms except for the varieties *grandis* (the cañon oak), *Hansenii*, *nana*, and *pendula*, characterized by Jepson in his Flora of California, pp. 358–9, f. 65, and Silva of California, p. 224, pl. 69. Even the following extremes, given specific recognition, lack as sharp delimitation as could be wished.

QUERCUS TOMENTELLA Engelmann.

Plates 211 and 212.

Quercus tomentella Engelmann, Trans. Acad. St. Louis, vol. 3, p. 393, 1877.—Greene, Ill. W. Amer. Oaks, p. 45, 57, pl. 26.—Sargent, Silva, vol. 8, p. 109, pl. 402; Manual, f. 210.—Britton & Shafer, N. A. Trees, f. 264.—Eastwood, Occ. Papers Calif. Acad., no. 9, pl. 28.—Sudworth, Forest Trees of Pac. Slope, f. 136–7.

Twigs moderate (3 mm.), fluted, dingy short-pilose. Buds brown, brownish- or gray-tomentulose, ovoid, 3×6 mm. or the terminal becoming 7×12 mm. Leaves evergreen, per-

sisting even into the third year, elliptical-ovate, acute or rather acuminate, rounded at base or slightly cordate, subentire to almost pungently low-serrate or dentate, more or less crisped and slightly revolute, moderate (2.5–4×7–10 or even 7×12 cm.), thick and hard, glossy and glabrous above except for the somewhat granular midrib, whitened beneath and more or less, but often transiently, stellate-floccose, or pilose along the midrib; veins about 10–12×2, occasionally forking, low-looped, the minute paler venulation not raised on either face; petiole rusty-villous, 2×10 mm. Catkins: ♂, 30–40 mm. long, tufted-lanate, closely flowered, the numerous glabrous oblong acuminate anthers little exserted; ♀, 3–5 mm. long, 1- or few-flowered at the end. Fruit biennial?, subsessile; cup half-round, large (25–30 mm. in diameter), with somewhat thick-based appressed often lacerate tomentose or deeply imbedded scales; acorn from ovoid and half-included to elongated and as much as 26×30 mm. and long-exserted.

Pacific islands of the Californian region. A tree 10–20 m. high.—The island oak.

Specimens examined from without the United States: Guadalupe Island, west of Lower California (*Palmer, 89*, the type, and *88*, which is smaller-leaved and glabrescent; *Franceschi, 4, 5; Anthony, 248; Brown*, 1906; *Rose, 16013*).

Though kept apart, this is scarcely more than one of the manifold but perhaps differentiable forms of *Q. chrysolepis* of the Californian mainland, with which it is connected on the coastwise islands Sta. Rosa, Sta. Cruz, S. Clemente, and Sta. Catalina, where it presents serrated and *Pasania*-like small foliage in what may be called f. *conjungens*, Trelease, Field Mus. Nat. Hist., Publ. 212, p. 78, 1923.

QUERCUS PALMERI Engelmann.

Plates 213 and 214.

Quercus Palmeri Engelmann, Trans. Acad. St. Louis, vol. 3, p. 393, 1877.
Q. Dunnii Kellogg, Pacific Rural Press, June 7, 1879.
Q. chrysolepis Palmeri Engelmann in Brewer & Watson, Bot. Calif., vol. 2, p. 97, 1880.—Sudworth, Forest Trees Pac. Slope, f. 135.

Twigs slender (2 mm.), more or less fluted, minutely and at length sparsely yellow stellate-scurfy, red with very small inconspicuous lenticels. Buds yellow-hairy, ovoid, 2 mm. in diameter, sometimes with persisting stipules. Leaves evergreen, suborbicular, acute, more or less cordate, entire or typically pungent-dentate, small (scarcely 2×2–3 cm.), thick and hard, crisped or plicate along the sometimes recurved midrib, somewhat stellate-scurfy above and more so or very brown-resinous beneath; veins about 6×2, occasionally forking and rather obscurely looped; petiole tomentulose, scarcely 1×2 mm. Catkins: ♂, 50 mm. long, hairy, rather loosely flowered, the numerous round-ovoid acuminate glabrous anthers little exserted. Fruit biennial, subsessile; cup turbinate-saucer-shaped, moderate (12–18 mm. in diameter), with the appressed scales covered by dense fulvous tomentum, its uneven margin somewhat inrolled; acorn oblong, 25–30 mm. long, well exserted.

Desert region of Mexico and adjacent California.—A divaricately branched shrub 4–5 m. high; the type from 80 miles east of San Diego.

Specimens examined.—United States. San Diego Co., California (*Palmer, 30*, the type; *Vasey*, 1880). Mexico. Mountains of northern Baja California (*Orcutt, 639;* July 2, 1885); San Martir (*Brandegee*, May 13, 1893); Sierra de la Laguna (*Brandegee*, Jan. 23, 1890); Jappa Rancho (*Dunn*, October, 1888, in the herbarium of Rev. E. L. Greene and of the New York Botanical Garden, representative of *Q. Dunnii*).

QUERCUS WILCOXII Rydberg

Plate 215.

Quercus Wilcoxii Rydberg, Bull. N. Y. Bot. Gard., vol. 2, p. 227, pl. 33, 1901.—Britton & Shafer, N. A. Trees, f. 262.

Western Sierra Madre region in the United States; the type from Fort Huachuca, Arizona.

Very like *Q. Palmeri* of the extreme Southwest and agreeing with the rest of its group in having the acorn tomentose within.

QUERCUS VACCINIFOLIA Kellogg.

Plate 210.

Quercus vaccinifolia Kellogg, Proc. Cal. Acad., vol. 1, p. 96, 1855.—Jepson, Silva Calif., p. 224, pl. 69.
Q. chrysolepis vaccinifolia Engelmann, Trans. Acad. Sci., St. Louis, vol. 3, p. 393, 1877.—Sargent, Silva, vol. 8, p. 106, pl. 400.—Sudworth, Forest Trees of Pac. Sl., f. 135.

Californian region, from Oregon through California to Nevada. The name variously spelled *vaccinifolia*, as written by the author, and *vacciniifolia*.—The huckleberry-leaved oak.

ERYTHROBALANUS. The Red or Black Oaks.

ERYTHROBALANUS.

Stamens rather few (4–5) with mostly oblong submucronate anthers; styles elongated, outcurved, with spatulate-oblong stigmas; fruit prevailingly but not always maturing the second season, usually subsessile; abortive ovules characteristically near or at the apex of the fertile seed and easily removed with it (deeply lateral or basal in the Durifoliae, some Scytophyllae, Andinae, and Costaricenses), the shell tomentose and often 3-ridged within and the seed correspondingly grooved; scales of the cup usually blunt or merely acute, rarely keeled or thickened or tomentose; leaves often incisely lobed, the lobes, teeth, or vein-tips characteristically produced in awns.

Shrubs or trees, often of the largest size, with mostly ridged but not scaly dark bark and moderately hard often reddish wood, more porous and with ducts less plugged by tyloses than in Leucobalanus. Exclusively American, north of the Isthmus, except for a small group of species in the Andes of Colombia.

DURIFOLIAE.—Low, with slender tomentose or glabrescent twigs, ovoid buds, rather small lanceolate or elliptical entire or few-toothed short-petioled mostly pale and glabrous leaves somewhat raised-venulose above, and annual subsessile small short-stalked fruit (with lateral or basal abortive ovules, as in the white oaks), and thin blunt appressed canescent scales.—Southern Rocky Mountain region, barely reaching the western Sierra Madre.

Leaves ovate, 15–20 mm. wide, glabrescent or scurfy beneath.....*Q. Emoryi.*
Leaves narrowly lanceolate, canescent beneath.....*Q. durifolia.*

QUERCUS EMORYI Torrey.

Plates 9, 216, and 217.

Quercus Emoryi Torrey, Rept. Emory, p. 151, pl. 9, 1848.—Sargent, Silva, vol. 8, p. 103, pl. 397.—Wooton, Bull. N. Mex. Agr. Exper. Sta., no. 51, p. 22, f.—Lewis, Trees of Tex., f. 14.—Trelease, Proc. Amer. Philos. Soc., vol. 51, p. 168, 171, pl. 13.
Q. hastata Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 171.—Liebmann-Oersted, Chênes Amér. Trop., p. 22, pl. 46.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 36.

Twigs slender (2 mm.), scarcely fluted, from yellowish scurfy-tomentose glabrescent and rather glossy red with scarcely discernible lenticels. Buds brown, glabrate and rather glossy, ovoid, 2×3 or finally 3×8 mm. Leaves deciduous, thick and hard, elliptical or oblong or ovate, mucronately acute, truncate at base or cordate, entire or unequally or repandly toothed, flat, small (1–2×3–6 cm.), glossy, glabrous, or somewhat puberulent along the midrib above and fleecy in sheltered places beneath; veins about 10×2, looped; petiole somewhat tomentose, 1×5 mm. Catkins: ♂, 40 mm. long, pale-fleecy, the glabrous rounded anthers little exserted. Fruit annual, solitary or paired on at most short peduncles; cup half-round, small (about 10 mm. in diameter), with thin appressed blunt canescent scales; acorn narrowly ellipsoid, some 8×15–20 mm., about one-third included.

Western Sierra Madre region of Mexico, chiefly north of the international boundary.—Called black oak.

Specimens examined.—United States. Texas. Without locality (*Emory*, the type in the Torrey herbarium, at the New York Botanical Garden; *Frémont, a, b,*); Limpia River (*Bigelow*); Ft. Davis (*Blake*); West Texas (*Wright, 666*, the type of *Q. hastata;* 1865). New

Mexico. Bear Mts. (*Rusby, 387; Metcalfe, 704*); Sierra Co. (*Metcalfe, 1200*); Silver City (*Greene*, 1877); Tierra Blanca (*Mrs. Beals*, 1904). Arizona. Oak Creek, near Flagstaff (*Lowell*, 1910, 1911); near Tucson (*Sargent*, 1894; *Toumey, 282*); Dragoon (*Griffiths, 2058*); Coffee Basin (*Toumey, 283*); Sta. Catalina Mts. (*Toumey, 4;* 1894); Sta. Rita Mts. (*Engelmann & Sargent*, 1880; *Pringle*, 1884; *Toumey*, 1894; *Thornber, 266; Griffiths & Thornber, 316*); Huachuca Mts. (*Wilcox*, 1891, 1894; *Sargent*, 1894; *Toumey*, 1894–5); Bisbee (*Goodding, 169*); Chiricahua Mts. (*Toumey*, 1894; *Blumer, 1279*); without locality (*Palmer*, 1869). Boundary. Sta. Cruz Valley and Guadaloupe Pass (*Thurber, 765*); Sierra del Pajarito (*Schott, 3d*). Mexico. Sonora. Near Nogales (*Griffiths, 6779*); without locality (*Smith*). Chihuahua. East from Pearson (*Barlow*, 1911); vicinity of Chihuahua (*Palmer, 359*).

Aberrant southwestern white oaks have been taken for hybrids with this black oak: *Q. Emoryi*×*pungens* Wooten & Standley, Contr. U. S. Nat. Herb., vol. 19, p. 169; *Q. Emoryi*×*grisea* Wooten & Standley, *l. c.*, p. 170. So far as I can see, these offer no indication of *Emoryi* parentage, and no case is known to me of hybridity between Leucobalanus and Erythrobalanus.

QUERCUS DURIFOLIA von Seemen.

Plate 218.

Quercus durifolia v. Seemen, Bot. Jahrb., vol. 29, p. 95, 1900.

Twigs slender (2 mm.), little fluted, from very gray-tomentose finally glabrescent reddish and somewhat glossy. Buds glossy light brown, glabrescent, round-ovoid, 1.5×2 mm. Leaves deciduous?, short-lanceolate, mucronately very acute, obliquely subtruncate at base, entire or slightly wavy to several-toothed, very small (1×3–3.5 cm.), very glossy and nearly glabrous above except for the puberulent midrib, dull and somewhat canescent beneath; veins about 10×2, looped and finely anastomosing, most evident beneath; petiole hoary, about 1×5 mm. Catkins?. Fruit annual, solitary or paired and nearly sessile; cup half-round, small (8 mm. in diameter), with thin closely appressed blunt scales at first canescent but finally glabrescent and brown; acorn short-ovoid, somewhat silky, half-included, the abortive ovules lateral or basal as in *Q. Emoryi*.

Western Sierra Madre region of Mexico.

Specimens examined.—Durango (*Palmer, 771*, 1896, the type).

OLIGODONTAE.—Low, with slender twigs from scurfy-tomentose glabrescent, ovoid buds, rather small elliptical few-toothed short-petioled leaves slightly raised-venulose above, and annual subsessile small short fruit with thin blunt appressed canescent scales.—Western Sierra Madre region of Mexico.

Leaves glabrescent.....*Q. Eduardi.*
Leaves scurfy-tufted beneath.....f. *cespitifera.*

Quercus Eduardi n. nom.

Plate 219.

Quercus oligodonta v. Seemen, Bot. Jahrb., vol. 29, p. 96, 1900.—Not *Q. oligodonta* Saporta—*e. g.*, Monde des pl., p. 250, f. 4–5, 1879.

Twigs slender (2 mm.), somewhat fluted, from rather thinly and evanescently gray-scurfy-tomentose becoming glossy and reddish. Buds rather glossy light brown, glabrescent, ovoid, 1.5×2.5 mm. Leaves deciduous, oblong-elliptical, mucronately rather acute, slightly cordate, from entire to coarsely repand-serrate with shortly aristate teeth, small (1.5×3 to 4×6 cm.), glossy, glabrous or with puberulent midrib above, stellate-scurfy beneath becoming glabrate; veins about 6×2, more or less forking and obscurely looped; petiole glabrescent, 1×5 mm. Catkins?. Fruit annual, solitary and nearly sessile; cup somewhat turbinate, small (10 mm. in diameter), with thin appressed rounded scales from canescent glabrate and brown; acorn ovoid or elongated and some 10 mm. long, fully half-included, pale and slightly silky.

Western Sierra Madre region of Mexico.—A tree 5–8 m. high, yielding good dark red wood, called encino colorado.

Specimens examined.—Durango (*Palmer, 956*, 1896, the type); without locality (*Rose*, Aug. 13, 1897); Sierra de la Candela (*Endlich, 2, 4*); Bolaños to Guadalajara (*Rose, 3024*); Plateado to Colotlan (*Rose, 2693, 3655*); Sta. Teresa, Tepic (*Rose, 2224*).

Sterile shoots with longer stellate tufts on the leaves, distinct to the naked eye, f. **cespitifera,** occur in the Berlin herbarium from Jaral (*Schumann, 1311*, June 18, 1885).

NITIDISSIMAE.—Low, with slender from stellate-scurfy glabrescent twigs, ovoid buds, rather small ovate typically entire slender-petioled very glossy dark green leaves sharply white-venulose above and more or less scurfy beneath, and rather large ovoid buds.—Mexican table land.

Leaves acutely ovate, cordate, awn-pointed.....*Q. nitidissima.*

Quercus nitidissima n. sp.

Plate 218.

Twigs usually rather short and slender (2 mm.), fluted, from minutely stellate-scurfy glabrescent and brownish with small lenticels. Buds glossy brown, glabrescent, round-ovoid, 2×3 mm. Leaves deciduous, ovate, mucronately acute, cordate, entire or very low-repand, small (1.5–2×2.5–4 cm.), very glossy deep green on both faces, glabrous and finely white-venulose above, detachably white-stellate beneath with inconspicuous veinlets; veins about 6×2, looped; petiole puberulent, 1×5 mm. Catkins: ♂, 20 mm. long, fleecy, closely flowered, the glabrous oblong anthers little exserted. Fruit?.

Mexican table-land.

Specimens examined.—Cadereyta, Queretaro (*Rose, Painter & Rose, 9720*, Aug. 21, 1905, the type, in the U. S. National herbarium).

VIMINEAE.—Rather small trees with slender tomentose or glabrescent twigs, ovoid buds, mostly lanceolate or oblong rather small entire or somewhat aristately toothed awn-pointed short-petioled glabrate leaves more or less venulose above, and, so far as known, moderate fruit with thin blunt appressed tomentose scales.—Western Sierra Madre region of Mexico.

Petioles short (5 mm.).
  Leaves ovate to oblong, short.
    Nearly or quite entire.
      Flat.
        Broad, subtruncate at base.....*Q. Duraznillo.*
        Elongated, rounded at base.....f. *cochutensis.*
      Convex above, short, cordate.....f. *bullata.*
    Coarsely dentate.....f. *pinetorum.*
  Leaves lance-ovate, elongated.....*Q. balsequillana.*
  Leaves lanceolate or lance-oblong.....*Q. viminea.*
Petioles rather long (10 mm.).....*Q. bolanyosensis.*

Quercus Duraznillo n. sp.

Plates 220 and 221.

Twigs slender (2 mm.), fluted, from gray-tomentulose glabrate and glossy red with hardly discernible lenticels. Buds brown, glabrous, ovoid, 2×3 mm. Leaves evergreen?, thick and hard, elliptical to ovate-lanceolate, acute, mucronate, cordate or truncate and sometimes oblique at base, entire or unequally mucronately 1- or 2-toothed on each side, flat, small (1.5–2×3.5–5 cm.), glossy, glabrous, or somewhat fleecy beneath near the base; veins about 6–8×2, looped; petiole fleecy above, 1×5 mm. Catkins: ♂, scarcely 30 mm. long, woolly, closely flowered, the glabrous anthers little exserted. Fruit?.

Western Sierra Madre region of Mexico.—A small tree 3–6 m. high, called encino duraznillo, encino colorado, or simply encino.

Specimens examined.—Chihuahua. Baquiriachic to La Joya (*Endlich, 1277b*, Apr. 9, 1906, the type); Agua Caliente to Balsequillo (*Endlich, 1277*); Balleza to Baquiriachic (*Endlich, 1279*); Cerro Nanaruchic (?*Endlich, 1281*); Cusihuiriachic (*Pringle, 2112*).

In the region of the type is a form with entire convex cordate leaves, f. **bullata**; Balleza to Baquiriachic (*Endlich, 1277a*). In southwestern Chihuahua (Batopilas, *Palmer, 302*, called yerba buena) and in Durango (Sierra de Gamon, *Endlich, 2a, 9*, Sept. 2, 1903, a shrub or small tree becoming 5 m. high, called encino colorado), occurs what is taken for a form of this species, but making an approach to *Q. Eduardi* which is the prevalent oak of this type in the latter State. In Sonora it varies in a form with deeply sinuate-dentate leaves 1.5–2×4–6 cm., f. **pinetorum**, Los Pinitos, at 2,000 m. altitude (*Hartman, 131*, Oct. 11, 1890), and, in the same State, as a tree 9–10 m. high, with round-based elongated leaves 2×10 cm., f. **cochutensis**, Cochute (*Hartman, 72*, Oct. 5, 1890).

Quercus balsequillana n. sp.

Plate 220.

Twigs rather slender (2–3 mm.), fluted, from short-floccose glabrate, glossy red with minute pale lenticels. Buds dull straw-color, glabrous, ovoid, scarcely 2×3 mm. Leaves evergreen, lance-oblong, rather obtuse, mucronate, very cordate, entire, rather small (1.5–2.5×6–9 cm.), glossy, soon glabrous or somewhat furfuraceous beneath in sheltered places; veins about 12×2, evanescent beneath, obscurely looped above; petiole somewhat fleecy, 2×3 mm. Catkins: ♂, (young) about 20 mm. long, glabrate, rather distantly few-flowered. Fruit ?.

Western Sierra Madre region of Mexico.—A tree 5–6 m. high, yielding good wood, called encino.

Specimens examined.—Valley of the Rio Balsequillo, Chihuahua (*Endlich, 1275*, Apr. 5, 1906, the type).

Quercus viminea n. sp.

Plate 222.

Twigs slender (2 mm.), fluted, from dingy scurfy-tomentose glabrescent, rather glossy red, with little-evident lenticels. Buds reddish brown, glabrescent, acutely ovoid, 2×3 mm. Leaves deciduous, narrowly lanceolate, very acute, typically round-based, entire or aristately low-serrate above, small (1 or 1.5–2×4–10 cm.), glabrous and glossy; veins about 12×2, looped; petiole hoary or glabrescent, 1×5 mm. Flowers and fruit ?.

Western Sierra Madre region of Mexico.—A tree 7–10 m. high.

Specimens examined.—Chihuahua. Agua Caliente de Huachara (*Endlich, 790c*, the type, in the Berlin herbarium); Rio San Juan (*Endlich, 1280*). Sonora. Sierra del Naçori, etc. (*Hartman, 342; Lloyd, 468*); Sierra de los Alamos (*Palmer, 368*); La Chumata (*Brown*, May 1905).

Quercus bolanyosensis n. sp.

Plate 223.

Twigs slender (2 mm.), somewhat fluted, minutely dingy-scurfy or glabrescent, from red turning gray with numerous small prominent lenticels. Buds rather glossy light brown, nearly glabrate, ovoid, scarcely 2×3 mm. Leaves deciduous, linear-lanceolate or almost narrowly triangular, aristately very acute, oblique, from acute to mostly abruptly rounded at base, entire or very unequally but deeply aristately few-toothed, small (1–1.5×7–11 cm.), glossy above, thinly and finely rusty-velvety on both faces, the browning lower surface scarcely venulose; veins about 6–8×2, scarcely looped; petiole slender, puberulent, 10–15 mm. long. Catkins ?. Fruit biennial, solitary or paired on rather slender stalks about 5 mm. long; cup deep-saucer-shaped, small (10 mm. in diameter), with thin appressed blunt scales from gray-puberulent becoming brown; acorn elongated-ovoid, about half-included, silky-scurfy.

Western Sierra Madre region of Mexico.

Specimens examined.—West of Bolaños, Jalisco (*Rose, 2958*, Sept. 15–17, 1897, the type); Dolores to Sta. Gertrudis, Tepic (*Rose, 2031*, Aug. 7, 1897).

PENINSULARES.—Rather small trees with slender tomentose twigs, elongated ovoid buds, lance-elliptical acute moderately small often coarsely bristly-toothed short-petioled tomentulose or glabrate raised-venulose leaves, and annual subsessile rather small fruit with thin blunt appressed more or less canescent scales.—Desert region of Baja California.

Leaves glabrescent.....*Q. devia.*
Leaves persistently tomentose, especially beneath.....*Q. peninsularis.*

QUERCUS DEVIA Goldman.

Plate 224.

Quercus devia Goldman, Contr. U. S. Nat. Herb., vol. 16, p. 322, 1916.

Twigs slender (2 mm.), somewhat fluted, scurfy-tomentose becoming glabrous with rather distinct small round lenticels. Buds glabrescent, acutely ovoid, 2×3 mm. Leaves persistent, broadly lanceolate to oblong, very acute, subcordate, aristately several-toothed, rather small (1–3×5–10 cm.), often dingy-fleecy beneath in sheltered places; veins about 10×2, somewhat looped; petiole fleecy or glabrescent, 1×3–8 mm. Flowers ?. Fruit annual, solitary, subsessile; cup saucer-shaped, small (10 mm. in diameter), with thin appressed blunt tomentulose scales; acorn oblong, 15–20 mm. long, covered only at the base.

Desert region of Mexico.—A tree 20 mm. high.

Specimens examined.—Baja California. El Sauz to la Chuparosa (*Nelson & Goldman, 7454*, Jan. 23, 1906, the type in the U. S. National herbarium); La Laguna to El Paraiso (*Nelson & Goldman, 7471*) San Simon Mts. at 2,600 m. (*Brewster*, 1887). Without data (*Diguet*).

Quercus peninsularis n. sp.

Plate 225.

Twigs rather slender (2–3 mm.), somewhat fluted, yellow-tomentose, in the second season glabrescent and reddish-barked with scarcely evident lenticels. Buds red-brown with blunt ciliate scales, globose, 2 mm. in diameter. Leaves deciduous, oblong or somewhat ovate-lanceolate, aristately acute, rounded or truncate at base to cordate, entire to sharply bristly-serrate or dentate, rather small (1.5–2.5×5–7 or 3.5×8 cm.), rather dull, from matted yellow-stellate glabrescent above and often beneath; veins about 8×2, rather faint, obscurely looped; petiole more or less hairy, 1×5–8 mm. Catkins: ♂, 30 mm. long, tomentose, closely flowered, the oblong glabrous anthers little exserted. Fruit ?.

Desert region of Mexico.

Specimens examined.—Baja California. San Pedro Martir (*Brandegee*, May 23, 1893, the type, in the herbarium of the Arnold Arboretum; May 6, 1893; May 14, 1893); northern Baja California (*Orcutt*, 1882).

HYPOLEUCAE.—Rather small trees with slender from tomentulose glabrescent twigs, round-ovoid buds, rather small lanceolate typically entire narrowly revolute moderately long-petioled leaves impressed-veiny above and very densely white-matted beneath, and annual short-stalked moderate-sized elongated fruit with thin blunt appressed canescent scales.—Chihuahuan region, chiefly north of the international border.

Leaves long-acute.....*Q. hypoleuca.*

QUERCUS HYPOLEUCA Engelmann.

Plate 226.

Quercus hypoleuca Engelmann, Trans. Acad., St. Louis, vol. 3, p. 384, 1876.—Sargent, Silva, p. 117, pl. 405; Manual, f. 205.—Britton & Shafer, N. A. Trees, f. 258.—Greene, Ill. W. A. Oaks, pl. 6.—Trelease, Proc. Amer. Phil. Soc., vol. 51, pl. 13.

Q. confertifolia Torrey, Bot. U. S. & Mex. Bound., p. 207, 1849.—Not Humboldt & Bonpland, Plant. Aequinoct., vol. 2, p. 53, pl. 94, 1809.

Twigs rather slender (2–3 mm.), little fluted, rather persistently gray-felted, red with scarcely evident lenticels or somewhat pruinose in age. Buds red, glabrescent with ciliate scales, ovoid, scarcely 2×3 mm. Leaves more or less evergreen, lanceolate, aristately very

acute, rounded at base, typically entire, or with a few small setiferous teeth or even deeply and coarsely serrate above, revolute, rather small (2–3×5–8 or 10 cm.), glabrous and blue-green above, densely canescent-tomentulose beneath; veins about 10–12×2, or with evanescent intermediates, branched and rather obscurely looped near the margin, the reticulation inconspicuous; petiole tomentulose or glabrescent, 1.5×15 mm. Catkins: ♂, 60 mm. long, white-cottony, rather openly flowered, the glabrous ellipsoidal anthers exserted; ♀, 5–10 mm. long, 1- or 2-flowered at the end. Fruit annual, solitary or unequally paired on more or less hoary peduncles 2×5–15 mm.; cup turbinately hemispherical, small (10 mm. in diameter), with thin appressed blunt at first very tomentose scales pale brown when abraded; acorn narrowly oblong, about one-third included.

Western Sierra Madre region, chiefly north of the international boundary.—A tree 10–20 m. high, or maturing as a shrub. Called white-leaf or silver-leaf oak.

Specimens examined.—United States. New Mexico. Without locality [Copper Mines] (*Wright*, 1869; collected by *Thurber*, the type in the same locality; *Rusby*, 1881); Beaver Mts. (*Rusby, 385*); Silver City (*Metcalfe, 45*); Ft. Bayard (*Blumer, 86*); Pinos Altos (*Miss Mulford, 783*). Arizona. San Francisco Mts. (*Smith*); Chiricahua Mts. (*Blumer, 1261*); Sta. Rita Mts. (*Pringle*, 1881; *Shear, 4223; Griffiths & Thornber, 118*); Huachuca Mts. (*Toumey*, 1895; *Wilcox*, 1892, and 1894 with some fruit normally annual and other acorns—because of arrested and renewed growth?—on old wood); Bisbee (*Goodding, 237*). Boundary. Sierra del Pajarito (*Schott*, July 28, 1855); S. Luis Mts. (*Mearns, 177*). Mexico. Chihuahua. S. Diego (*Hartman, 584*).

The specific name *hypoleuca* has been given to a segregate of the European *Q. sessiliflora* by Gandoger, Fl. Europae, vol. 21, p. 37, 1890.

SCYTOPHYLLAE.—Rather small trees with moderate from tomentulose glabrescent twigs, conical-ovoid buds, medium-sized usually aristately low-toothed (sometimes entire or deeply and sharply serrate) mostly moderately petioled leaves shallowly impressed-veiny above and creamy-short-tomentose beneath, and annual short-stalked moderate-sized fruit with thin blunt appressed canescent scales (the abortive ovules lateral, thus approaching the white oaks).—Western Sierra Madre and adjacent Cordillera of Mexico.

Leaves rather large, sharply toothed above: petioles long for the group (20 mm. or more).
- Leaves obovate ..... *Q. scytophylla.*
- Leaves oblanceolate, evanescently glaucescent above ..... *Q. epileuca.*

Leaves rather large, cuneate, toothed; petioles very short ..... *P. campanariensis.*
Leaves moderate, or small for the group: petioles moderate (as a rule scarcely 10 mm.).
- Oblanceolate-oblong or elliptical.
  - Acute.
    - Rather finely serrate ..... *Q. incarnata.*
    - Coarsely serrate.
      - Oblong, broad-based ..... f. *longa.*
      - Oblanceolate, cuneate ..... f. *grosse-serrata.*
  - Obtuse, subentire, elliptical ..... f. *ampla.*
- Obovate, aristate-denticulate ..... *Q. omissa.*

QUERCUS SCYTOPHYLLA Liebmann.

Plate 227.

Quercus scytophylla Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 180.—Liebmann-Oersted, Chênes Amér. Trop., p. 24, pl. 17.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 57.

Twigs moderate (3 mm.), fluted, from minutely scurfy glabrescent, dark reddish, dull, with prominent small at first brown lenticels. Buds glossy brown, glabrescent, ovoid, 2×3 mm. Leaves deciduous?, lanceolate to typically obovate, mostly acute, obliquely rather rounded at base, entire or typically coarsely several-toothed above, large (mostly 7–8×13–15 cm.), glabrous and glossy above, densely and tightly creamy-tomentulose beneath; veins about 8×2, somewhat forking, obscurely looped; petiole glabrate, 1.5×20 mm. Catkins?. Fruit annual, solitary on a stalk scarcely 3×5 mm.; cup deep-saucer-shaped, rather small (about

12 mm. in diameter), with thin appressed blunt brownish pubescent scales; acorn ovoid, 15–20 mm. long, covered at base only.

Cordilleran region of Mexico.

Specimens examined.—Oaxaca. Yalala to Yagochi, at 2,000–2,600 m. (*Liebmann, 144–6, 3557*, the types); S. Pedro Nolasco to Castresano (*Liebmann, 140, 142–3, 3444, 3556*); Cuyamecalco to Coyuba (*Conzatti & Gomez, 2390*).

Quercus epileuca n. sp.

Plate 229.

Twigs moderate (3–4 mm.), fluted, from dingy-scurfy glabrescent and dark glossy red with minute inconspicuous lenticels. Buds glossy red-brown, glabrescent, ovoid, 2–3×3–4 mm. Leaves deciduous, subelliptical, acute or acuminate, rounded at base, sharply serrate with rather few aristate teeth above the middle, slightly revolute, rather large (2.5–5×7 or 9–12 cm.), glabrous, dull and very lightly white-glaucous above, becoming glossy olive-green when abraded, finely yellow-tomentose beneath; veins about 10×2, somewhat forking, at most obscurely looped; petiole finely tomentose, 2×15–20 mm. Flowers and fruit?.

Western Sierra Madre region of Mexico.—Perhaps an extreme of *Q. incarnata*.

Specimens examined.—Sierra del Naçori, Sonora, at 1,800 m. (*Hartman, 336, 337*, Dec. 12, 1890, the type); Campanario, Morelia, Michoacan (*Arsène, 5859*, with some leaves obovate).

Quercus campanariensis n. sp.

Plate 228.

Twigs rather slender (2 mm.), fluted, from rather densely scurfy quickly glabrescent and grayish with prominent small lenticels. Buds glossy light brown, more or less hairy, ovoid, 2×3 mm. Leaves deciduous, oblanceolate-obovate, acute, long-cuneate or the smaller rounded at the narrowed base, aristately very coarsely several-toothed above, large (5–7×11–14 cm.), glabrous but rather dull above, rather deciduously creamy-tomentulose beneath; veins about 8×2, scarcely looped, prominent and salmon-colored beneath; petiole glabrate, about 5 mm. long. Inflorescence and fruit?.

Western Sierra Madre region of Mexico.

Specimens examined.—Campanario, near Morelia, Michoacan (*Arsène, 6004 bis*, the type as sheet *1002433* in the U. S. National herbarium).

Quercus incarnata n. sp.

Plates 229 to 231.

Twigs moderate (3 mm.), somewhat fluted, from gray-tomentose becoming glabrescent and dark red. Buds dull brown, hairy, ovoid to subusiform, 3×5–6 mm. Leaves deciduous?, elliptical-obovate or oblong, obtuse to acute, mucronate, truncate or rounded at base, entire to undulately mucronate-toothed, especially upwards, or in some forms sharply coarse-serrate, revolute, rather small (1.5–2×4–5 cm. or more), slightly stellate-scurfy to glabrate and glossy above, minutely but very densely yellow-tomentose beneath; veins about 8×2. running into the teeth or marginal awns, somewhat forking and obscurely looped; petiole from canescent glabrescent and flesh-colored, 1.5×5–10 or 15 mm. Catkins: ♂, 40 mm. long, stellate-tomentose, rather closely flowered, the glabrous ellipsoid anthers little exserted; ♀, about 5 mm. long, canescent, 2-flowered. Fruit annual, solitary or paired, short-stalked; cup shallow, rather turbinate, small (10–12 mm. in diameter), with thin appressed blunt or lacerate subcanescent scales; acorn ovoid, 10 mm. long, about half-included.

Western Sierra Madre region of Mexico.—A tree 6–8 or even 15 m. high.

Specimens examined.—Chihuahua. Ojitos to Bocoyna, at 2,500 m. (*Endlich, 728b*, Jan. 2, 1905, the type); Tascates to Ojitos (*Endlich, 782a*); Basagote to Tascates (*Endlich, 790d*, noted as 8–10 m. high, yielding especially good wood and rich in tannin, called encino prieto); vicinity of La Joya (*Endlich, 782d*). Durango. Sierra de la Candela (*Endlich, 7*). Campanario, Morelia, Michoacan (*Arsène, 5807, 6036*).

A variable species, of which, as forms, may be noted.—f. **ampla,**, with elliptical nearly entire leaves 2.5–5×6.5–9 cm. (*Endlich, 728b*) in part; f. **longa,** with oblong not deeply serrate leaves equally large (*Endlich, 782a* in part); and f. **grosse-serrata,** with the leaves long-cuneate and deeply serrate (*Endlich, 782d* in part).

QUERCUS OMISSA A. de Candolle.

Plate 231.

Quercus omissa A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 28, 1864.—Liebmann-Oersted, Chênes Amér. Trop., pl. 18.

Twigs moderate (3 mm.), fluted, dark gray, sparingly dingy-puberulent. Buds dull brown, floccose at tip, fusiform-ovoid, 2.5×5–6 mm. Leaves deciduous?, elliptical-oblong to obovate, obtuse, cordate, somewhat spinulose or serrate above the middle, rather small (3–4×5–6 cm.), glabrous and glossy above, creamy short-tomentose beneath; veins about 8×2, passing into the short teeth or awns and somewhat looped; petiole tomentose, about 1×5 mm. Catkins?. Fruit annual, solitary or paired on peduncles scarcely 10 mm. long; cup round, small (about 10 mm. in diameter), with thin appressed very obtuse brownish-tomentose scales; acorn (immature), ovoid, brown-scurfy, deeply included.

Western Sierra Madre region of Mexico.

Specimens examined.—Without precise locality (*Seemann, 1969*, the type).

The name *omissa* has been applied specifically to a segregate of the European *Q. pedunculata* by Gandoger, Fl. Europ., vol. 21, p. 33, 1890.

FLOCCOSAE.—Moderate-sized trees with scurfy-tomentose or glabrescent medium-sized twigs, moderately large usually aristately few-toothed moderately petioled rather thin leaves shallowly impressed-veiny above and more or less persistently scurfy-floccose beneath.—Eastern Sierra Madre region of Mexico.

Leaves elliptical, rather obtuse.....*Q. floccosa.*

QUERCUS FLOCCOSA Liebmann.

Plate 232.

Quercus floccosa Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 178.—Liebmann-Oersted, Chênes Amér. Trop., p. 24, pl. D.–A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p.77.

Twigs moderate (3–4 mm.), fluted, for a time rusty scurfy-tomentose, dark red. Buds?. Leaves deciduous?, elliptical-obovate, aristately short-pointed, rounded or acute at base, entire or obscurely few- and shallow-toothed above, finely undulate or crisped, revolute, rather large (6–9×9–16 cm.), nearly glabrous and rather glossy on both faces or typically rusty-floccose beneath; veins about 8×2, looped, the upper running into the teeth or into marginal awns; petiole woolly, 2×10–15 mm. Flowers and fruit?.

Eastern Sierra Madre region of Mexico.

Specimens examined.—Pico de Orizaba, at 2,600–3,300 m. (*Liebmann, 144, 150, 193, 3479*, the types; *?Seaton, 230*).

ORIZABAEAE.—Rather large trees with rather slender tomentose or glabrescent twigs, ovoid buds, and moderately large elliptical-ovate pointed moderately petioled entire or aristately few-toothed thin venulose leaves, at first very fleecy.—Eastern Sierra Madre region of Mexico.

Leaves subcordately rounded at base.....*Q. orizabae.*

QUERCUS ORIZABAE Liebmann.

Plate 233.

Quercus orizabae Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 189.—Oersted, Bidrag Kundsk. Egefamil., pl. 4.—Liebmann-Oersted, Chênes Amér. Trop., p. 27.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 79.

Twigs moderate (3 mm.), fluted, from rusty-floccose becoming glabrous and rather reddish. Buds red-brown, more or less hairy, round-ovoid, 2 mm. in diameter. Leaves deciduous?,

elliptical-ovate and either entire or shallowly aristately 3-toothed above, or elliptical-oblong or obovate and rather deeply inequilaterally 3-toothed or aristate-shouldered, acute, obliquely and often subcordately rounded at base, rather large (3–7×8–14 cm.) glabrescent and very glossy above, duller and somewhat rusty-fleecy in sheltered places beneath, slightly revolute; veins about 8–10×2, somewhat forked and looping; petiole more or less pubescent, 1.5×15–25 mm. Flowers and fruit?.

Eastern Sierra Madre region of Mexico.

Specimens examined.—Pico de Orizaba, at 2,600–3,300 m. (*Liebmann, 83–4, 3539*, Sept., 1841, the type; also apparently, *48, 223, 3496*); without locality (*?Haenke*, in the herbarium of the National Museum at Prag).

CRASSIFOLIAE.—Moderate-sized trees with somewhat stout mostly persistently tomentose twigs, ovoid-fusiform buds, occasionally persistent stipules, rather large prevailingly obovate usually revolute aristately somewhat repandly toothed (rarely entire) short-petioled leaves impressed veiny above and persistently mostly rusty-tomentose beneath, and either annual or biennial usually short-peduncled moderate-sized short fruit with thin blunt appressed tomentose scales.—Mexican table-land, Sierra Madre and cordilleran regions, and Central America.

Leaves large, at most low-toothed.
- Fruit annual.
  - Leaves rather deeply cordate, low-toothed usually throughout ..... *Q. crassifolia.*
  - Leaves round-based to shallowly cordate, entire, or toothed above ..... *Q. fulva.*
- Fruit biennial; leaves obovate, truncate at base or somewhat cordate.
  - Shallow-toothed. Mexico ..... *Q. felipensis.*
  - Rather coarsely toothed above. Guatemala.
    - Principal veins impressed ..... *Q. brachystachys.*
    - Leaves cancellate above ..... *f. venulosa.*
  - Entire. Guatemala ..... *f. caerulea.*

Leaves of medium size or small.
- Somewhat lobed, or doubly serrate ..... *Q. moreliana.*
- Sharply and deeply serrate.
  - Fruit annual ..... *Q. stipularis.*
  - Fruit biennial ..... *Q. errans.*
- Shallowly toothed or entire.
  - Fruit annual; leaves short-obovate, merely aristate from the ends of the veins ..... *Q. chicamolensis.*
  - Fruit biennial.
    - Leaves subelliptical, entire.
      - Round-based ..... *Q. Hahnii.*
      - Slightly cordate ..... *Q. esperanzae.*
    - Leaves round to obovate, often low-toothed ..... *Q. orbiculata.*

Leaves small for the group.
- Fruit biennial; leaves obovate, nearly entire ..... *Q. miguelitensis.*
- Fruit annual.
  - Leaves broadly lanceolate, scarcely revolute, usually entire ..... *Q. dysophylla.*
  - Leaves oblanceolate-oblong, revolute, rather toothed above ..... *Q. splendens.*

QUERCUS CRASSIFOLIA Humboldt and Bonpland.

Plate 234.

Quercus crassifolia Humboldt & Bonpland, Plant. Aequinoct., vol. 2, p. 49, pl. 91, 1809.—Liebmann-Oersted, Chênes Amér. Trop., pl. 18.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 56.
Q. spinulosa Martens & Galeotti, Bull. Acad. Brux., vol. 10, part 1, p. 218, 1843.

Twigs rather stout (4–5 mm.), fluted, from tawny floccose-tomentose glabrous or merely scurfy, and dark gray. Buds glossy, reddish, nearly glabrous, ovoid, 3×5 mm. Leaves deciduous, elliptical to obovate or orbicular, obtuse to variously acute or subacuminate, cordate, aristately low- and broad-toothed, large (6×9 to 12×14 cm.), thick, impressed-veiny and glabrous above except for the somewhat scurfy nerves, tawny tomentose-fleecy beneath, the denudable surface bullate-granular; veins about 8×2, obscurely looped if at all; petiole hairy, 3×5–10 or even 15 mm. long. Catkins: ♂, 80–90 mm. long, tawny-floccose, rather loosely

flowered, the glabrous anthers little exserted. Fruit annual, solitary or 2 or 3 on a stalk 3×5–20 mm.; cup deep-saucer-shaped, moderate (15 mm. in diameter), with thin appressed blunt hoary or glabrous and brown coarse scales; acorn ellipsoidal, 15–20 mm. long, one-third or more included.

Mexican table-land (and adjacent transition zone of the Eastern Sierra Madre?).—A tree 25–35 m. high.

Specimens examined.—Chilpancingo (*Bonpland*, the type); Atotonilco el Chico (*Karwinski*, May, 1827); Jalacingo (*Schiede, 1110*); Zacualtipan (*Berlandier, A, 241*); about Real del Monte (*Ehrenberg, A, 262, 907; Gregg, 638, 638a*); La Encarnacion (*Rose, Painter & Rose, 8437*, in a form approaching *Q. fulva*); San Luis Potosi (*?Schaffner, 896*); Trinidad (*?Pringle, 9810*); Esperanza (*Schenck, 91*); Perote (*?Schenck, 908*); Zacuapam (*?Schenck, 695*); without locality (*Bonpland, α, β; Karwinski; Graham, 329; Uhde, 277, ? 310*). Volcan d'Orizaba (*Galeotti, 114, 4840*, the type collection of *Q. spinulosa*, seen only in the Delessert herbarium).

QUERCUS FULVA Liebmann.

Plates 235 and 236.

Quercus fulva Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 183.—Liebmann-Oersted, Chênes Amér. Trop., p. 25, pl. 2.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 77.

Twigs rather stout (4 mm.), little fluted, reddish-tomentose. Buds hairy, conical-fusiform, at length 3×10 mm. Leaves deciduous, obovate, shortly acuminate obliquely rounded at base, entire or shallowly few-toothed toward the end, rather large (5–8×10–13 cm.), glabrate and glossy above, densely at first reddish tomentose beneath; veins about 10×2, rugose-anastomosing; petiole tomentose, 2×10–25 mm. Fruit annual, nearly sessile; cup shallow, moderate (15 mm. in diameter), with thin rather close blunt tomentose scales; acorn?.

Western Sierra Madre region of Mexico.

Specimens examined.—Without precise locality (*Seemann, 1973*, the type). Chihuahua. Sierra Madre (*Pringle, 1361*); Arroyo de los Bueyes (*Endlich, 643, 1285*). Durango. Santiago Papasquiaro (*Palmer, 76*); Sierra de la Candela (*Endlich, 5*). Michoacan. San Andres (*Ross, 376*, from which the cup is described); Cerro Tecojote (*Arsène, 31*); Cerro Azul (*Arsène, 5365, 5750*); Campanario (*Arsène, 6037*); Quinceo (*Arsène, 3235, 5673*). All near Morelia.

Quercus felipensis n. sp.

Plate 237.

Twigs moderate (3–4 mm.), somewhat fluted, tawny-floccose through the first season, when denuded rather dull red-brown with inconspicuous small lenticels. Buds brown, somewhat hairy, oblong, at length 3×4 mm., the upper for a time with thin and wavy brown stipules. Leaves deciduous, obovate, very obtuse to subacuminate, rounded or slightly cordate at base, repand or exceptionally somewhat shouldered or shallow-lobed above, slightly revolute, large (6–11×11–17 cm.), glabrous above except for the tawny-tomentose flexuous midrib, and impressed-veiny, firmly tawny tomentose-fleecy beneath; veins about 8–10×2, irregularly branched and somewhat looped, ending in weak bristles; petiole fulvous-hairy, 2×10–15 or even 25 mm. Catkins?. Fruit biennial, solitary or clustered on a peduncle about 3×5–10 or even 20 mm.; cup somewhat turbinate, moderate (15 mm. in diameter), with thin appressed coarse blunt somewhat canescent scales; acorn elongated-ovoid, 18 mm. long, scarcely one-third included.

Cordilleran region of Mexico.

Specimens examined.—Oaxaca. Cerro de S. Felipe, at 2,600 m. or more (*C. L. Smith, 776*, Aug. 26, 1894, the type, in the herbarium of the Missouri Botanical Garden; *Liebmann, 447, 3467*); Chinantla (*Liebmann, 3466*); Yavesia (*Liebmann, 149, 3469*); Cumbre de Istepec (*Liebmann, 3468*); without locality (*Liebmann, 3470*).

QUERCUS BRACHYSTACHYS Bentham.

Plates 238 to 240.

Quercus brachystachys Bentham, Plant. Hartweg., p. 91, 1842.—Liebmann-Oersted, Chênes Amér. Trop., pl. 2.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 75.

Twigs rather stout (4 mm.), fluted, rather persistently dingy long-tomentose. Buds dull brown, rather hairy, ovoid, 2×3 mm. or more. Leaves subevergreen, elliptical to ovate or obovate, acute or subacuminate, truncate or slightly retuse at base, shallowly repand with aristate teeth above, rather large (4–8×7–15 cm.), glossy and glabrous above or somewhat floccose in sheltered places, dingy long-tomentose beneath, the denuded surface granular-bullate; veins about 10×2, forking but scarcely looped, the principal veins impressed above; petiole tightly dingy-tomentose, about 3×10 mm. Catkins: ♂, about 70 mm. long, very dingy-floccose, closely flowered, the glabrous ellipsoidal mucronate anthers little exserted. Fruit biennial, mostly in clusters of about 3 on peduncles 5×10–15 mm.; cup nearly hemispherical, moderate (15 mm. in diameter), with rather thick-based close blunt at first brown- or gray-tomentose scales; acorn ovoid, about 18 mm. long, less than half-included.

Central American region.—A small tree 7–8 m. high.

Specimens examined.—Guatemala. S. Lucas (*Hartweg, 618*, the type; *Smith, 2189*); Mixco to Antigua (*Trelease, 43–47*); Antigua (*Hayes*, 1860); San Rafael (*Smith, 2628*); without locality (*v. Warscewicz, 41–2*); Quiché to Totonicapan (*Cook, 25, 30*).

A form scarcely to be referred elsewhere but with distinctly blue-green entire leaves, occurring on the edge of the barranca below Quezaltenango (*Trelease, 29, 30*, April 6, 1915) may be known as f. **caerulea.** Slender-twigged young specimens from the same locality (*Trelease, 28*) with oblanceolate bright green coarsely toothed cancellate leaves may bear the name f. **venulosa.**

Quercus moreliana n. sp.

Plate 241.

Twigs rather stout (3–5 mm.), fluted, gray-floccose-tomentose but quickly glabrescent and dark red with minute pale lenticels. Buds ?. Leaves deciduous, thick, impressed-reticulate, roundish-obovate, acute, cordate, aristately serrate to doubly serrate or sublobed, moderate 4–6×6–9 cm.), essentially glabrous and glossy above, rusty fleecy-tomentose beneath; veins about 6–8×2, indefinitely looped; petiole gray-tomentose, very short (scarcely 5 mm.); stipules broad and membranous, rather long-persistent. Inflorescence and fruit ?.

Western Sierra Madre of Mexico.

Specimens examined.—Campanario, Morelia, Michoacan, at 2,300 m. (*Arsène, 6681*, the type as sheet *1000800* in the U. S. National herbarium).

QUERCUS STIPULARIS Humboldt and Bonpland.

Plates 242 to 244.

Quercus stipularis Humboldt & Bonpland, Plant. Aequinoct., vol. 2, p. 47, pl. 90, 1809.

Twigs rather stout (3–5 mm.), fluted, floccose-tomentose. Buds brownish, more or less pubescent, ovoid, 3×5 mm., with persistent stipules. Leaves deciduous, thick, impressed-reticulate, elliptical-ovate to obovate, acute or somewhat acuminate, cordate, aristately serrate, moderate (3.5–5×7–10 cm.), glabrous and glossy above, except for the puberulent midrib, rusty fleecy-tomentose beneath; veins about 6–8×2, indefinitely looped; petiole tomentose, 2×10–15 mm. Catkins?. Fruit annual, solitary or paired on a very short thick stalk; cup shallow, moderate (about 15 mm. in diameter), with thin, coarse, rather loose, blunt, more or less glabrous scales; acorn ovoid, about 15 mm. long, scarcely one-third included.

Mexican table-land.

Specimens examined.—Near Actopan (*Bonpland*, the type); about Real del Monte (*Hartweg, 424, 426*, the types of *Q. splendens pallidior* A. de Candolle in de Candolle, Prodromus, vol. 16,

part 2, p. 57, 1864; *Ehrenberg, 911, 1022–3*). From this it is hardly possible to separate, except that they have rather turbinate cups, specimens with sharply aristate-toothed leaves and annual fruit from about San Luis Potosi (*Parry & Palmer, 837*, and intermingled with the biennial-fruited *no. 836*).

Quercus errans n. sp.

Plate 245.

Twigs rather stout (4–5 mm.), somewhat fluted, fleecy-tomentose. Buds red-brown, somewhat pubescent, ovoid, 2×3 mm. or more. Leaves somewhat evergreen, thick, impressed-reticulate, elliptical-oblong or obovate, rather pointed, cordate, aristately dentate above, moderate (4–5×6–10 cm.), glabrous except for the midrib or puberulent above, rusty fleecy-tomentose beneath; veins about 6–8×2, more or less definitely looped: petiole tomentose, 2×10–15 mm. Catkins ?. Fruit biennial, mostly solitary, subsessile; cup turbinately cup-shaped, moderate (15 mm. in diameter), with thin, coarse, appressed, very blunt, hoary scales; acorn ovoid, 15 mm. long, scarcely one-third included.

Mexican table-land and adjacent eastern declivities.

Specimens examined.—Perote (*Hahn, 667*, the type); about Real del Monte (*Ehrenberg, C. 895–6, 920, 1021, 1284*).

Quercus chicamolensis n. nom.

Plate 246.

Quercus mollis Martens & Galeotti, Bull. Acad. Brux., vol. 10, part 1, p. 216, 1843.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 78.—Not *Q. mollis* Rafinesque, Alsogr. Amer., p. 22, 1838.

Twigs moderate (about 3 mm.), fluted, at first densely yellow-tomentose, becoming rather glossy and blackish when denuded. Buds ?. Leaves deciduous ?, elliptical or obovate, subacute, cordate, ciliately short-aristate above the middle, rather small (3.5–4×5–6.5 cm.), glossy, glabrescent and impressed-veiny above, yellow-tomentose beneath; veins about 10×2, hardly looped; petiole tomentose, 2×5 mm. Catkins: ♀, at first stellate-tomentose, scarcely 15 mm. long, with 1–3 flowers at intervals. Fruit biennial ?, the cup with thin, appressed, very blunt, canescent scales, brown at the margin, acorn unknown.

Cordilleran region of Mexico.—A tree 10–15 m. high.

Specimens examined.—Mixteca Alta, Oaxaca, at 2,100–2,400 m. (*Galeotti, 102*, the type, also *99* in the Delessert herbarium); Cerro Chicamole, Oaxaca, at 3,000–3,200 m. (*Purpus, 4088*).

The stigmas appear to be broad in the type, and it is possible that the species belongs among the white oaks of the group Reticulatae, the leaves of which are often pungently mucronate from the ends of the principal veins.

Quercus Hahnii n. sp.

Plate 247.

Twigs rather slender (2–3 mm.), fluted, from yellowish tomentose glabrescent and rather glossy. Buds rather glossy light brown, glabrescent, ovoid, 2×3 mm. Leaves deciduous ?, elliptical passing into obovate, aristately obtuse, obliquely rounded at base or slightly cordate, entire, revolute, rather large (4–7×9–16 cm.), glabrous and glossy above, somewhat brownish-tomentose beneath, the denudable surface bullate-granular; veins about 14×2, forking several times and more or less looped; petiole short-tomentose, 2×10 mm. Catkins ?. Fruit biennial, 1 or 2 at end of a peduncle 3–4×10 mm., or of double this length with more fruits; cup deep saucer-shaped, small (about 12 mm. in diameter), with thin appressed blunt canescent scales with abraded brown tips, its margin usually inrolled; acorn ovoid, 15 mm. long, less than half included.

Mexican table-land and adjacent mountains.

Specimens examined.—Forest of Cajalpa, near Toluca (*Hahn, 347*, 1865–6, the type, as of *Q. grandifolia* Fournier in herb.); Eslava, D. F. (*Pringle, 11851*); Cuyamaloya, Hidalgo (*Pringle, 13829*). Mt. Orizaba, at 3,000 m. (*Stone, 137*).

Quercus esperanzae n. sp.

Plate 248.

Twigs rather slender (2–3 mm.), fluted, from dingy tomentose becoming glabrous and rather glossy red with inconspicuous lenticels. Buds rather glossy brown, glabrescent, ovoid, about 2 mm. in diameter. Leaves deciduous, elliptical or somewhat ovate, obtuse, shallow-cordate, strongly revolute, entire, small (2–3×4–7 cm.), glabrous and glossy above, detachably densely creamy-tomentose beneath, the denuded surface bullate-granular; veins about 10–12×2, deeply impressed above, branched and looping, the ultimate areolation on the upper face very fine with thick pale raised veinlets; petiole tomentose or glabrescent, 1.5×5 mm. Catkins?. Fruit biennial, solitary or paired, subsessile, the young cups with very blunt thin appressed dingy puberulent scales.

Mexican table-land and adjacent mountains.

Specimens examined.—Esperanza (*Purpus, 5332*, Apr., 1911, the type; *Schenck, 91*).

Quercus orbiculata n. sp.

Plate 249.

Twigs moderate (3 mm.), fluted, scurfy becoming glossy red with inconspicuous lenticels. Buds rather glossy red-brown, somewhat puberulent, acutely ovoid, 2×3 mm. Leaves partly evergreen, orbicular- to elliptical-obovate, acute to very obtuse, cordate, entire, or aristate from the veins or somewhat undulately dentate above, strongly revolute, moderate (3–4×5–6 or as much as 5×8 cm.), glabrescent or slightly scurfy or papillate above, densely tawny-fleecy beneath; veins about 6–8×2, forked and somewhat looping, impressed reticulate; petiole scurfy, 5–10 mm. long. Catkins: ♂, 20 mm. long, tawny-hairy, the short-ellipsoid glabrous anthers little exserted. Fruit biennial, solitary or paired on thick stalks 5–30 mm. long; cup turbinately cup-shaped, moderate (12–15 mm. in diameter), with thin appressed blunt brown and brown-ciliate scales; acorn round-ovoid, half-included.

Mexican table-land.

Specimens examined.—Vicinity of San Luis Potosi (*Parry & Palmer, 836*, the type).

Quercus miguelitensis n. sp.

Plate 249.

Twigs slender (2 mm.), fluted, glabrous, red, without conspicuous lenticels. Buds glossy dark brown, somewhat hairy above, 2 mm. in diameter. Leaves evergreen, obovate, obtuse to acute, rounded at base, narrowly revolute, entire or undulate to pungently low-serrate, small (2–3×4–5 cm.), glabrous and glossy above, detachably tawny stellate-tomentose beneath, the denuded surface scarcely granular; veins about 6–8×2, rather obscurely looped, with the secondaries impressed above; petiole red, glabrescent, 1×5–10 mm. Catkins?. Fruit biennial, sessile, the young cups somewhat turbinate, with thin appressed scales from hoary becoming glossy brown and glabrous.

Mexican table-land.

Specimens examined.—Mountains of San Miguelito, San Luis Potosi (*Schaffner, 897* in part, the type in the Gray herbarium).

Quercus dysophylla Bentham.

Plates 250 and 251.

Quercus dysophylla Bentham, Plant. Hartweg., p. 55, 1840.—Liebmann-Oersted, Chênes Amér. Trop., pl. 7.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 76.

Twigs moderate (3 mm.), fluted, from densely tawny-tomentose becoming glabrescent and glossy reddish gray. Buds rather glossy red-brown, canescent at least below, elongated-ovoid, 2–3×3–5 mm. Leaves deciduous, elliptical-ovate or oblong, or somewhat widened upwards,

acute to obtuse, slightly cordate, entire to rather deeply mucronate-dentate above, strongly revolute, rather small (2–3×5–8 cm.), from stellate-scurfy becoming papillate and finally glabrescent and glossy above, persistently and densely rusty-tomentose beneath; veins about 10×2, forked and looping, the ultimate reticulation finely impressed above; petiole tomentose, 2×5–10 mm. Catkins: ♂, 20 mm. long, tawny-hairy, the glabrous ellipsoid anthers little exserted: ♀, scarcely 5 mm. long, with 1 or 2 flowers. Fruit annual, solitary or paired on very short thick stalks, sometimes appearing biennial from the falling of the leaves of spurs; cup turbinately saucer-shaped, moderate (12–15 mm. in diameter), with thin moderately close obtuse brown- or gray-tomentulose scales; acorn ovoid or elongated, sometimes 18 mm. long, covered only at the base.

Mexican table-land.—Called manzanilla.

Specimens examined.—Huasco (*Hartweg, 421*, the type, at Kew); about Real del Monte (*Ehrenberg, 894, 956*); without locality (*?Leibold, 233*).

Here is to be referred, perhaps, a Cordilleran specimen (Tepoxuchil, Puebla, *Arsène, 2100*), with very small toothed leaves scarcely 1×3.5 cm., which is suggestive also of *Q. stipularis* except in size and geographic occurrence.

QUERCUS SPLENDENS Née.

Plate 252.

Quercus splendens Née, An. Cienc. Nat., vol. 3, p. 275, 1801.—Liebmann-Oersted, Chênes Amér. Trop., pl. 9.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 57.

Twigs moderate (3 mm.), somewhat fluted, densely yellow-tomentose. Buds ?, for a time with persistent woolly stipules. Leaves oblong- or ovate-elliptical or somewhat widened upwards, round-based or shallow-cordate, irregularly and unequally toothed but not aristate, acute, rather small (3–4×8 cm.), somewhat short-pubescent above, persistently and densely yellow-tomentose beneath; veins about 8×2; petiole scarcely 2 mm. long. Catkins ?. Fruit ?.

Western Sierra Madre region of Mexico; the type from Tixtla.

A spreading-branched small tree 5 mm. high, known only from the original description of a young shoot. Comparable only with the white oaks clustering about *Q. reticulata* and the black oaks of the *crassifolia* series, especially *Q. dysophylla*, though with nearly sessile awnless leaves. In any event, it is not to be matched with any later collections unless it be *Ehrenberg, 894*, figured on pl. 252 for comparison with the type; and for the present the name *splendens* can not replace any of those over which it has priority.

RACEMIFLORAE.—Moderately large trees with thick tomentose twigs, rounded buds, large cordate pandurate-obovate or orbicular concave aristately dentate petioled leaves impressed-veiny above and tomentose beneath, and annual small fruit in elongated raceme-like spikes or catkins, with tomentose scales.—Western Sierra Madre and cordilleran regions of Mexico.

Petioles long (20–30 mm.).
- Leaves longer than broad, somewhat repand ..... *Q. Urbani.*
- Leaves isodiametric, aristate from the veins ..... *Q. radiata.*

Petioles rather short (scarcely 15 mm.) ..... *Q. Conzattii.*

QUERCUS URBANI Trelease.

Plate 253.

Quercus Urbani Trelease, Proc. Amer. Philosoph. Soc., vol. 60, p. 32, pl. 2, 1921.

Twigs very stout (5–7 or even 10 mm.), deeply fluted, from densely yellowish-tomentose becoming blackish but persistently gray-hairy the second season. Buds rounded, somewhat tomentose. Leaves deciduous, pandurate-orbicular, shortly acuminate, deeply cordate-auricled, lightly concave between the aristate vein-tips, large (15×16 cm.), the convex glossy and impressed-reticulate upper face glabrous except along the veins, the lower surface densely

creamy-tomentose; veins about 12×2, more or less forking, submarginally looped; petiole yellow-tomentose, 3×25 mm. Catkins?. Fruit annual, in yellow-tomentose spikes 80–110 mm. long, densely flowered toward the end; cup half-round, small (10 mm. in diameter), with thin appressed blunt fulvous-tomentose scales; acorn ovoid, 10 mm. long, canescent.

Western Sierra Madre region of Mexico.—A tree 8–10 m. high, with tortuous trunk, called encino cucharilla from its deeply spoon-shaped leaves.

Specimens examined.—Without precise locality, but in Michoacan or Guerrero, at 1,800 m. (*Langlassé, 1066*, June 20, 1899, the type, in the Berlin herbarium).

QUERCUS RADIATA Trelease.

Plate 253.

Quercus radiata Trelease, Proc. Amer. Philosoph. Soc., vol. 60, p. 33, pl. 3, 1921.

Twigs stout (6–8 mm.), deeply fluted, densely yellowish-tomentose, somewhat velvety for several seasons, with small crowded lenticels. Buds brown, somewhat tomentose, rounded, 2–3 mm. in diameter. Leaves deciduous, pandurate-orbicular, obtuse or slightly deltoid-pointed, deeply cordate-auriculate, not at all concave between the radiately aristate vein-tips, large (9–13 cm. wide and long), the dull impressed-reticulate upper face glabrous except along the veins, the lower face removably rusty-tomentose and somewhat bullate between the veinlets when denuded; veins about 10×2, forked or somewhat pinnately branched, looped near the margin; petiole yellow-tomentose, 3×10–15 mm. Catkins?. Fruit annual, in somewhat loosely yellow-stellate spikes 60–80 mm. long, densely fruited from about the middle; cup half-round, very small (7–8 mm. in diameter), with thin appressed blunt fulvous-tomentose scales; acorn elongated-ovoid, 8 mm. long, canescent, half-included.

Western Sierra Madre region of Mexico.

Specimens examined.—Top of the range near Santa Teresa, Tepic (*Rose, 2230*, Aug. 13, 1897, the type in the U. S. National herbarium, as sheet no. *301144*).

QUERCUS CONZATTII Trelease.

Plate 254.

Quercus Conzattii Trelease, Proc. Amer. Philosoph. Soc., vol. 60, p. 33, pl. 4, 1921.

Twigs stout (5 mm.), fluted, gray-tomentose even through the second year, then gray with numerous small lenticels. Buds brown, somewhat hairy, ovoid, 3×5 mm. or more. Leaves deciduous, orbicular, very obtuse to acute or short-acuminate, cordate, entire except for slight concavity of the margin between the veins, large (8–10×9–12 cm.), convex, glossy, more or less impressed-reticulate and glabrous or somewhat lightly hairy along the midrib above, densely rather grayish stellate-lanose beneath; veins about 8–10×2, forked and pinnately branched, the upper ending in slender marginal bristles about 5 mm. long, scarcely looped; petiole gray-tomentose, 3×5–15 mm. Catkins?. Fruit annual, in ascending woolly spikes 40–50 mm. long, densely fruited throughout; cup half-round, small (scarcely 10 mm. in diameter), with thin appressed blunt glabrate brown scales; acorn ovoid, scarcely 10 mm. long, canescent, half-included.

Cordilleran region of Mexico.

Specimens examined.—Cuesta de Huauchillo, Nochixtlan, Oaxaca, at 2,000 m. (*Conzatti, 1900*, June 29, 1907, the type in the herbarium of the Field Museum).

PENNIVENIAE.—Moderately large trees with thick tomentose twigs, large ovoid buds, large suborbicular or broadly elliptic leaves impressed veiny above and tomentose beneath, and annual moderate subsessile fruit with blunt appressed subtomentose scales.—Western Sierra Madre region of Mexico.

Petioles short; leaves not aristate.....*Q. tepicana.*
Petioles elongated; leaves aristate.....*Q. pennivenia.*

Quercus tepicana n. sp.

Plate 255.

Twigs stout (4–5 mm.), scarcely fluted, glabrous, from purplish becoming buff, with small pale lenticels. Buds glabrous, glossy red brown. Leaves deciduous, broadly elliptical, obtuse, cordate, slightly repand, not aristate, large (13×17 cm.), glabrous and glossy green above, sparingly dingy stellate-tomentose beneath; veins about 14×2, obscurely looped; petiole quickly glabrescent, 4×scarcely 15 mm. Catkins?. Fruit (disconnected) moderate (scarcely 15 mm. in diameter), the cup shallow-saucer-shaped with thin appressed blunt subglabrescent scales, and the pubescent ovoid acorn (scarcely 15 mm. long) covered at base only.

Western Sierra Madre region of Mexico.

Specimens examined.—Near Pedro Paulo, Tepic (*Rose*, Aug. 3, 1897, the type as sheet *842924* in the U. S. National herbarium).

Quercus pennivenia n. sp.

Plate 256.

Twigs very stout (6–10 mm.), fluted, tomentose. Buds from gray-hairy glabrescent, with elongated brown scales, ovoid, 6×12 mm. Leaves deciduous?, round-obovate, very obtuse, deeply cordate, entire, aristate from the upper veins, large (fully 15×15 cm.), the very convex upper face glabrous and glossy, the lower loosely dingy-tomentose; veins about 8×2, looping near the slightly revolute margin, the larger ones pinnately branching; petiole from yellow-hairy glabrescent, 4×35–50 mm. Catkins?. Fruit annual, solitary or paired on a puberulent peduncle scarcely 5 mm. long; cup rather shallow cup-shaped with contracted throat, moderate (15 mm. in diameter), with thin appressed very blunt scales from tomentulose becoming glabrate and glossy brown; acorn depressed, included.

Western Sierra Madre region of Mexico.—A tree 10–15 m. high.

Specimens examined.—Without precise locality (*Seemann, 1968, 1998*, the type in the Hookerian herbarium at Kew); mountains west of Chuchichupa, Chihuahua (*Hartman, 713*, from which the fruit is described); Sierra del Naçori, Sonora (*Hartman, 343*).

AEREAE.—Moderate-sized trees with moderately stout stellate or glabrescent twigs, round-ovoid buds, and moderate oblanceolate-oblong chiefly entire short-petioled leaves finely raised-reticulate above and golden-puberulent or glabrescent beneath.—Western Sierra Madre region of Mexico.

Leaves elongated, pointed ..... *Q. aerea.*

Quercus aerea n. sp.

Plate 257.

Twigs moderate (3 mm.), fluted, rather persistently yellow-tomentulose or scurfy, reddish with small pale lenticels when denuded. Buds round-ovoid, glabrescent. Leaves evergreen, elliptical to obovate or subpentagonal, aristately acute or acuminate, shallowly cordate with closed sinus, entire or aristately few-toothed above, narrowly revolute, moderate (4–5×8–10 cm.), slightly glossy, rather bluish green and sparsely scurfy above, denudably yellow-puberulent and resiniferous beneath so as to be of the color of "bronzy old gold": veins about 8–10×2, somewhat branched, looped near the margin, with rather prominent cross-veins beneath; petiole tomentulose, 2×4 mm. Flowers and fruit?

Western Sierra Madre region of Mexico.

Specimens examined.—La Bufa, Cusihuiriachic, Chihuahua (*Pringle, 1570*, the type).

COCCOLOBAEFOLIAE.—Moderate-sized trees with moderately stout stellate or glabrescent twigs, ovoid buds, rather large round-obovate entire short-petioled leaves finely raised-reticulate above and golden-puberulent or glabrescent beneath, and, so far as known, annual medium-sized fruit with blunt thin appressed glossy scales.—Mexican table-land and adjacent Sierras.

Leaves glabrescent; eastern ..... *Q. coccolobaefolia.*
Leaves puberulent beneath; western ..... *Q. Jonesi.*

Quercus Jonesi n. sp.

Plate 257.

Twigs stout (5 mm.), strongly fluted, glabrous, dull purplish with minute pale lenticels. Buds light brown, soft-hairy, round-ovoid, about 3 mm. in diameter. Leaves deciduous, somewhat pandurately round-obovate, obtuse or shortly triangular-acuminate, cordate, entire or lightly repand, little crisped, minutely cartilaginous-revolute, large (6–9 or 10×9–11 cm.), at most sparingly stellate above, denudably but densely finely coppery-stellate beneath, and with some axillary tufts; veins about 8×2, with unequal often pinnate branches, somewhat irregularly looped; petiole glabrate, red, 2×4 mm. Catkins: ♀, of 1 or 2 sessile flowers with thin hairy scales and slender styles. Fruit annual, sessile, the (immature) rounded cup with thin glossy brown appressed blunt scales.

Western Sierra Madre region of Mexico.—A wide-spreading tree 7–14 m. high.

Specimens examined.—Chiquilistlan, Jalisco (*Jones, 446*, May 28, 1892, the type in the U. S. National herbarium).

PLANIPOCULEAE.—Moderate-sized trees with somewhat stout tomentulose twigs, ovoid buds, rather large subelliptical cordate usually somewhat revolute entire rather long-petioled leaves impressed veiny above and tomentulose beneath, and biennial short-peduncled moderate-sized short fruit with thin blunt appressed tomentose scales, incurved about the rim. Western Sierra Madre region of Mexico.

Cup saucer-shaped.
- Petiole fully 15 mm. long ..... *Q. planipocula.*
- Petiole scarcely 5 mm. long ..... *f. subsessilifolia.*

Cup subturbinately half-round ..... *Q. Rosei.*

Quercus coccolobaefolia n. sp.

Plate 258.

Twigs rather stout (4 mm.), strongly fluted, glabrous, red or brown with small lenticels. Buds light brown, rather persistently soft-hairy, ovoid, 2.5×4 mm. Leaves deciduous, round-ovate, obtuse, setose-mucronate, cordate often with closed sinus, entire, crisped, minutely cartilaginous-revolute, large (7–9×9–12 cm.), hard, sparsely and minutely stellate above, the slightly paler lower surface glabrous except for some axillary tufts; veins about 8×2, repeatedly branched and somewhat looped; petiole glabrous, scarcely 2×5 mm. Flowers and fruit?.

Mexican table-land.

Specimens examined.—Sta. Rosa, near Guanajuato (*Bonpland, 4269*, the type); vicinity of San Luis Potosi (*Parry & Palmer*, 1878, with the leaves resinous-dotted beneath); Jesus Maria, S. L. P. (*Nelson, 2*, with the somewhat scurfy-tomentose leaves awned from the ends of many veins, thus indicating its alignment among the black oaks).

A specimen of *Q. reticulata*, bearing the descriptive name adopted here for this black oak, occurs in the herbarium of the Muséum d'Histoire Naturelle, at Paris, noted as new and coming from the same locality as *reticulata*, while the present plant is without name. The probability is that its collectors intended the name to be used as is here done, but the possible crossing of labels makes this so uncertain that the name can hardly be attributed in its present use to Humboldt and Bonpland.

Quercus planipocula n. sp.

Plate 259.

Twigs moderate (3–4 mm.), somewhat fluted, rather transiently loosely yellow stellate-hairy, from reddish becoming gray with rather prominent lenticels when denuded. Buds rather glossy light brown, glabrescent except at the somewhat villous end, ovoid, 2×3 or 3×4 mm. Leaves deciduous, elliptic, ovate to obovate, aristately acute or acuminate, rounded at base or mostly openly cordate, narrowly revolute, entire or long-aristate from the upper veins or coarsely aristately serrate, rather large (5–6.5×10–12 cm.), from yellow stellate-

fleecy glabrescent except for the midrib and occasional scurf above, the lower face persistently yellowish-velvety with the midrib, etc., sometimes villous; veins about 12×2, with some evanescent intermediates, branching and looped, slightly impressed above like some of their branches; petiole pinkish, somewhat stellate-fleecy, 2×15–25 mm. Catkins ?. Fruit biennial, solitary or paired, short-stalked; cup saucer-shaped or very flat, rather large (20–25 mm. in diameter), with thin close blunt glabrate and glossy light brown or in age gray scales, the margin characteristically deeply inrolled; acorn round-ovoid, 15–20 mm. long, half-included or less.

Western Sierra Madre region of Mexico.

Specimens examined.—Foothills near Pedro Paulo, Tepic (*Rose, 1970*, Aug. 3, 1897, the type in the U. S. National herbarium, as sheet no. *300862*); foothills near Colomas, Sinaloa, at 1,300 m. (*Rose, 1648*, July 14, 1897).

With petioles scarcely 5 mm. long, it is f. **subsessilifolia**, from Sinaloa (*Montes & Salazar, 1169*, the type; *Rose*, 1897).

Quercus Rosei n. sp.

Plate 260.

Twigs moderate (3–4 mm.), fluted, yellow-tomentose for several years, reddish when denuded. Buds brown, woolly, ovoid, 3×4 mm. Leaves deciduous, elliptical to obovate, obtuse to mostly aristately acute or short-acuminate, rounded, truncate at base or subhastate to deeply cordate, entire, narrowly revolute, rather large (5–8×8–14 cm.), bluish green, glabrous except along the midrib and slightly glossy above, firmly rusty short-tomentose beneath and villous along the midrib, etc.; veins about 10×2, branching and looped, impressed above, with the ultimate fine venulation raised; petiole yellow-tomentose or somewhat glabrescent, pinkish, 2×15 mm. Catkins ?. Fruit biennial, mostly paired at end of a peduncle 3–4×10 mm.; cup turbinately saucer-shaped, moderate (about 15 mm. in diameter), with thin blunt somewhat loose brown scales, the margin inrolled almost to the bottom: acorn ovoid, scarcely 10×12 mm., half-included in the conspicuously larger cup.

Western Sierra Madre region of Mexico.

Specimens examined.—Vicinity of Sta. Teresa, Tepic (*Rose, 3458*, Aug. 13, 1897, the type in the U. S. National herbarium, as sheet no. *302437*, also *2223, 3449, 3457*).

PRAINEANAE.—Small trees with moderately stout glabrous twigs, ovoid buds, glabrous moderate elliptical to obovate rather long-petioled entire firm leaves venulose above, and biennial rather small silvery fruit.—Western Sierra Madre region of Mexico.

Leaves obovate, sharply venulose.....*Q. coffeaecolor.*
Leaves elliptical-obovate, sharply venulose beneath.....*Q. aequivenulosa.*
Leaves lance-elliptical, low-venulose beneath.....*Q. Praineana.*

Quercus coffeaecolor n. sp.

Plate 261.

Twigs moderate (2–3 mm.), somewhat fluted, glabrous, rather glossy red or purplish becoming gray with numerous small prominent lenticels. Buds glossy brown, glabrate with ciliate scales, round-ovoid, 2 mm. in diameter. Leaves deciduous, broadly elliptical or slightly widened upwards, very obtuse or somewhat deltoid-pointed and occasionally aristate, truncate or concave at base, entire or irregularly low-repand, moderate (6–7×8–10 cm.), dull, minutely sharp-venulose, blue-green and glabrous above, the (dried) coffee-brown under surface glabrous except for axillary tufts; veins about 8×2, rather indefinitely looped; petiole glabrous, 15–25 mm. long. Catkins ?. Fruit biennial, solitary or 2 or 3 on a short stalk; cup deep-saucer-shaped, rather small (12 mm. in diameter), with thin appressed blunt brown-puberulent scales; acorn canescent, less than one-third included.

Western Sierra Madre region of Mexico.

Specimens examined.—Foothills near Colomas, Sinaloa (*Rose, 1758*, the type in the U. S. National herbarium, as sheet no. *300629*).

Quercus aequivenulosa n. sp.

Plate 261.

Twigs rather slender (2–3 mm.), more or less fluted, glabrous, dull dark red, becoming grayish with numerous small rather prominent pale lenticels. Buds rather glossy brown, glabrescent, ovoid, 2×3–4 mm. Leaves deciduous, elliptical or slightly widened upwards, very obtuse, rounded or somewhat truncate at base, entire or low-undulate, moderate (3–4×6–10 cm.), dull, minutely but sharply venulose, blue-green and glabrous above, browning and with axillary tufts beneath; veins about 8×2, looped; petiole glabrous, 10–15 mm. long. Catkins ?. Fruit biennial, very short-stalked; cup deeply saucer-shaped, rather small (10 mm. in diameter), with thin appressed blunt gray- or brownish-puberulent scales; acorn canescent, ovoid, 10 mm. long, the lower third or less included.

Western Sierra Madre region of Mexico.

Specimens examined.—Top of the range near Sta. Teresa, Tepic (*Rose, 2231*, Aug. 13, 1897, the type in the U. S. National herbarium, as sheet no. *301145*).

Quercus Praineana n. sp.

Plate 262.

Twigs rather slender (2–3 mm.), scarcely fluted, glabrous, dull dark red becoming grayish the second season, with numerous small but prominent lenticels. Buds rather glossy red, glabrescent or somewhat gray-hairy above, ovoid, 2×4 to 4×6 mm. Leaves deciduous, elliptical-lanceolate, mucronately acute to obtuse, somewhat acute to typically rather truncate at base, entire or somewhat undulate above, moderate (3–4.5×7–10 cm.), rather glossy, glabrous and minutely venulose above, paler, duller, somewhat axillary-tufted and less venulose beneath; veins about 8×2, looped; petiole glabrous, 10 mm. long. Catkins: ♀, scarcely 3 mm. long, 2-flowered. Fruit biennial, very short-stalked; cup saucer-shaped, rather small (12 mm. in diameter), with thin appressed blunt silvery-puberulent scales; acorn equally silvery, ovoid, 12 mm. long, covered at base only.

Western Sierra Madre region of Mexico.—A small tree.

Specimens examined.—Mountains near Etzatlan, Jalisco, at 1,900 m. (*Pringle, 8854*, the type, October 29, 1904).

Dedicated to Sir David Prain, late director of the Royal Gardens at Kew, to whom I am indebted for very many favors.

LANGLASSEIAE.—Moderately large trees witn rather stout fleecy twigs, ovoid buds, medium-sized elliptical obtuse more or less cordate entire short-petioled somewhat scurfy leaves scarcely venulose above, and biennial medium-sized fruit with tomentulose scales.

Leaves crisped, persistently dingy-scurfy.....*Q. Langlassei.*
Leaves revolute, glabrescent.....*Q. chiquihuitillonis.*

Quercus Langlassei n. sp.

Plate 263.

Twigs moderate (3–4 mm.), somewhat fluted, thickly matted with persistent orange felt, beneath which the denuded surface is rather red and glossy. Buds brown, at length glabrescent, short-ovoid, 2×3 mm., the upper with persistent stipules. Leaves elliptical-oblong, very obtuse, cordate, entire, crisped and slightly revolute, moderate (3.5–5×9–13 cm.), rather persistently orange-stellate on both faces, glossy above and typically dull beneath; veins about 12–14×2, often with several evanescent intermediates, forking and looped, with indistinct venulation; petiole very yellow-tomentose, 2×4 mm. Fruit biennial, solitary and sessile; cup saucer-shaped, moderate (15 mm. in diameter) with thin appressed blunt or erose tomentose scales red-brown when abraded; acorn conical-ovoid, 10 mm. long, covered at base only.

Western Sierra Madre region of Mexico.

Specimens examined.—Without precise locality, but from Michoacan or Guerrero (*Langlassé, 1006*, Apr. 22, 1899, the type); Sinaloa (*Montes & Salazar, 1730*, with persistent leaves, the ♂ catkins fully 150 mm. long, fleecy, loosely flowered, with perianth segments about equaling the filaments, and glabrous elliptic-oblong anthers).

Quercus chiquihuitillonis n. sp.

Plate 264.

Twigs moderate (3 mm.), fluted, glabrate except in sheltered places, from very thickly yellowish-stellate, glossy brown with minute and inconspicuous lenticels. Buds?. Leaves thin but hard, somewhat irregularly elliptical, very obtuse, rounded at base or subcordate—on shoots varying into lanceolate and acute, somewhat revolute, rather large (3.5–6×8–12 or 16 cm.), glossy, rather blue-green and glabrous or slightly stellate above, the even more glossy lower surface glabrous or slightly floccose along the midrib; veins about 12–15×2, commonly with 1–3 evanescent intermediates, repeatedly forking, obscurely looped at some distance from the margin, with indistinct reticulation; petiole yellow-tomentose, 2×2–5 mm. Catkins: ♂, 50 mm. long, staringly white-hairy, rather loosely flowered, the glabrous anthers little exserted—some flowers with small ovoid galls. Fruit evidently biennial, solitary and sessile; cup very shallow, moderate (about 15 mm. in diameter), with thin appressed rather blunt somewhat ashen scales; acorn ovoid, 15 mm. long, covered at the base only.

Western Sierra Madre region of Mexico.—A large tree furnishing good timber, called encino blanco.

Specimens examined.—Chiquihuitillo at 900 m. (*Langlassé, 212*, June 29, 1898, the type); Hacienda Coahuayula, Michoacan (*Emrick, 113*); Acapulco (*Palmer 333*); without definite locality (*Seemann, 1975*).

ARISTATAE.—Moderate-sized trees with moderately stout rather persistently scurfy tomentose or subtomentose twigs, round? to fusiform buds, elliptical-obovate moderately petioled entire or slightly crenate or mucronately or aristately short-toothed leaves finely raised-reticulate above and glabrescent beneath, and annual rather small fruit with blunt thin appressed tomentose scales.—Western Sierra Madre and Central American regions.

Leaves elliptical-oblong, entire or denticulate.
- Petiole rather long.....*Q. aristata.*
- Petiole short.
  - Twigs brown-woolly.
    - Leaves more or less aristate.....*Q. productipes.*
    - Leaves not aristate.....*Q. exaristata.*
  - Twigs yellow-woolly.....*Q. hondurensis.*

Leaves elliptical-obovate, entire or crenate.....*Q. Endlichiana.*

QUERCUS ARISTATA Hooker and Arnott.

Plate 265.

Quercus aristata Hooker & Arnott, Bot. Beechey, p. 444, 1841.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 75.

Twigs rather slender (2–3 mm.), fluted, transiently gray-floccose, mostly red and glossy when denuded. Buds brown, from lanate usually glabrate and glossy, nearly round, 2 mm. in diameter. Leaves deciduous, elliptical-oblong or slightly widened upwards, very obtuse to subacute, entire but aristate from the midrib and usually one or two of the upper veins, rounded or truncate at base, or openly or convallately cordate, entire or undulate, somewhat crisped, very slightly callous-revolute, moderate (3–4×7–10 or 15 cm.), rather glossy, glabrous except for minute scurf near the base above and some axillary tufts beneath; veins about 8×2 or with fainter intermediates, upcurved, rather low-forking and looped; petiole more or less floccose or glabrate, red, 2×5–10 mm. Catkins: ♂, 50 mm. long, loosely hairy with rather crowded

flowers, the oblong glabrous anthers little exserted; ♀, scarcely 5 mm. long, 1- or 2-flowered at the end. Fruit annual, solitary or paired, subsessile; cup half-round, rather small (12 mm. in diameter), with thin blunt appressed gray-puberulent scales; acorn round-ovoid, fully half-included, canescent.

Western Sierra Madre region of Mexico.

Specimens examined.—Tepic. Between San Blas and Tepic (*Sinclair*, 1845, the type; *Barclay*); Cerro de Pinal (*Seemann, 1458*); Zopilote (*Lamb, 577*). Sinaloa. Foothills between Rosario and Colomas (*Rose, 1643*, from which the fruit is described). Possibly to be referred here also a specimen from Acapulco (*Hinds*, 1841, in the Kew herbarium).

Quercus productipes n. sp.

Plate 264.

Twigs moderate (3–4 mm.), somewhat fluted, transiently tawny-floccose, rather dull red-brown with minute lenticels when denuded. Buds rather glossy brown, from brown-lanate glabrescent, ovoid, 3×4 mm. Leaves deciduous, elliptical or somewhat widened upwards, very obtuse, aristate from the midrib and often from several of the upper veins, cordate or almost auricled at base, entire or undulate, somewhat crisped and minutely cartilaginous-revolute, moderate (3.5–5.5×6.5–10 cm.), slightly glossy, glabrate or somewhat stellate-fleecy in sheltered places, especially beneath; veins about 8×2, often with fainter intermediates, usually branched and looped; petiole hairy, 2×5–10 mm. Catkins: ♀, 30 mm. long, glabrescent, interruptedly several-flowered. Fruit biennial?, the young cup with thin appressed blunt glabrescent brown scales; acorn (normal?) very slender, 7×16 mm., evidently long-exserted.

Western Sierra Madre region of Mexico.

Specimens examined.—Mountains east of S. Leonel, toward Tepic (*Gregg, 977*, May 28, 1849, the type, in the herbarium of the Missouri Botanical Garden).

Quercus exaristata n. sp.

Plate 266.

Twigs moderate (3–4 mm.), somewhat fluted, transiently dingy-stellate, gray when denuded. Buds?. Leaves deciduous, elliptic-oblong, usually widened upwards, very obtuse and without even a terminal awn, rounded or subcordate at base, entire, narrowly revolute, coriaceous, somewhat glossy, glabrescent or somewhat scurfy in sheltered places above and paler and fleecy in places beneath; veins about 12×2, branching and looped; petiole hairy, scarcely 5 mm. long. Catkins: ♀, 15 mm. long, glabrescent, about 3-flowered toward the end. Fruit biennial, rather small, the shallow cup 10 mm. in diameter with thin appressed blunt rather glabrescent brown scales.

Western Sierra Madre region of Mexico.

Specimens examined.—Near Pedro Paulo, Tepic (*Rose*, Aug. 3, 1897, the type as sheet *842923* in the U. S. National herbarium).

Quercus hondurensis n. sp.

Plate 266.

Twigs moderate (3 mm.), somewhat fluted, rather persistently yellow-tomentose. Buds?. Leaves evergreen, lance- or elliptic-oblong, rather obtuse, transiently aristate from the midrib, rounded at base rather than cordate, entire, moderate (3×10 or when mature 5×13 cm. or more), slightly glossy, glabrous or somewhat stellate-fleecy in sheltered places beneath; veins about 12×2, branched and looped; petiole hairy, scarcely 5 mm. long. Catkins: ♂ as much as 100 mm. long, woolly, loosely flowered, the ellipsoid mucronate anthers exserted. Fruit?.

Central American region.

Specimens examined.—Honduras. San Pedro Sula (*Thieme, 5440*, the type as sheet *930480* in the U. S. National herbarium).

Quercus Endlichiana n. sp.

Plate 267.

Twigs moderate (3 mm.), fluted, from closely yellow-tomentose glabrate and glossy reddish with minute inconspicuous lenticels. Buds very light brown, gray-hairy, subfusiform, 4×7 mm. Leaves deciduous?, obovate, very obtuse, rather deeply cordate or revolutely subauriculate, entire or slightly undulate, crisped, moderate (4.5–8×6–13 cm.), slightly glossy green, becoming glabrous except for occasional stellate fleece and large pale axillary tufts beneath; veins about 8×2, frequently forking, irregularly looped; petiole from floccose becoming glabrous, 2×5–10 mm. Catkins: ♂, 50 mm. long, glabrate, closely flowered, the glabrous ellipsoid anthers little exserted; ♀, scarcely 5 mm. long, with 1 or 2 flowers. Fruit annual, solitary or paired, nearly sessile; cup somewhat turbinate, small (scarcely 10 mm. in diameter), with thin appressed blunt pale brown or somewhat canescent scales; acorn ovoid, about 8 mm. long, rather persistently gray-silky, half-included.

Western Sierra Madre region of Mexico.—A tree 4–6 or 8 m. high.

Specimens examined.—Durango. Sierra de la Candela (*Endlich, 6*, August 27, 1903, the type, in the Berlin herbarium, called encino). Chihuahua. Arroyo de los Bueyes, Sierra Madre (*Endlich, 1284*, called roble, rojaca or rocuró).

ANDINAE.—Moderate-sized trees with somewhat stout tomentose or glabrate twigs, usually fusiform buds sometimes with persistent stipules, rather large variously lanceolate rather short-petioled entire leaves (somewhat toothed in *Q. almaguerensis*) with the principal veins impressed above, glabrate except in sheltered places beneath, and annual nearly sessile large rounded fruit with thin blunt loose brown-woolly scales.—Mountains of Central America and Colombia.

Leaves cuneately subsessile.
- Entire, long-attenuate at both ends.....*Q. amphioxys.*
- Crenate or toothed above.....*Q. almaguerensis.*

Leaves moderately petioled.
- Twigs and petioles tomentose; leaves rather rugose.....*Q. tolimensis.*
- Twigs and petioles glabrate; leaves scarcely rugose.
  - Leaves large.
    - Lance-elliptical, subacute.....*Q. Humboldtii.*
    - Elliptical, obtuse.....v. *Lehmanniana.*
  - Leaves small for the group (scarcely 4×10 cm.).....*Q. Lindeni.*

Quercus amphioxys n. sp.

Plate 268.

Twigs rather slender (scarcely 3 mm.), fluted, soon glabrous, rather red with small brown lenticels. Buds somewhat glossy below, brown, fulvous-hairy above, ovoid-fusiform, 3×6–7 mm. Leaves lanceolate, acuminately attenuate at each end, entire, somewhat blistered, narrowly revolute, large (5–6×16 to nearly 25 cm.), glossy and glabrous on both faces; veins about 15×2, repeatedly forking but scarcely looped. Flowers and fruit?.

Central American region.

Specimens examined.—El Salvador. Volcan de San Salvador, at 2,300 m. (*Niederlein*, Jan. 9, 1898, the type).

Doubtfully placeable here are two sterile shoots from Cartago and Mount Irazu, COSTA RICA (*Scherzer*, 1853, in the Vienna herbarium), one with light brown buds and the foliage of this species, the other with similar buds, but leaves 9×25 cm., less acute at the extremities.

QUERCUS ALMAGUERENSIS Humboldt and Bonpland.

Plates 268 and 269.

Quercus almaguerensis Humboldt & Bonpland, Plant. Aequinoct., vol. 2, p. 157, pl. 131, 1809.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 80.

Twigs slender (2 mm.), somewhat fluted, glabrous, grayish buff. Buds glossy brown, glabrate, conical, 2×5 mm. Leaves obovate-oblanceolate, obtuse to somewhat acuminate, gradually narrowed to the base, crenately or serrately toothed near the end, with calloused

tips, large (5–6×12–16 cm.), glabrous, slightly glossy above and glaucous beneath; veins about 15×2, irregularly looped; petiole glabrous, scarcely 2×2 mm. Flowers and fruit?. Isolated acorns collected by *Wolcott*, referred here, are round-ovoid, rather large (25–30 mm.) and tomentose within.

Andean region.

Specimens examined.—Columbia. Almaguer, New Granada (*Bonpland*, the type); without definite locality (*Wolcott*, 1914).

QUERCUS TOLIMENSIS Humboldt and Bonpland.

Plates 270 and 271.

Quercus tolimensis Humboldt & Bonpland, Plant. Aequinoct., vol. 2, p. 153, pl. 129, 1809.—?v. Ettingshausen & Krašan, Denkschr. K. Akad. Wien, vol. 56, part 1, pl. 9.—?Liebmann-Oersted, Chênes Amér. Trop., pl. 25.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 32.

Twigs rather stout (sometimes 5 mm.), little fluted, brownish-floccose, becoming blackish with small pale lenticels. Buds glossy brown, rather persistently fulvous-hairy above, ovoid-fusiform, at length 3–4×6 mm. Leaves deciduous?, broadly lanceolate, rather acute, somewhat rounded at base, entire, crisped, revolute, rather large (2.5–5×9–15 cm.), glossy and glabrous or with puberulent midrib above, paler, rather dull and fleecy in the axils beneath; veins about 15×2, repeatedly forking and looped, impressed above. Catkins?. Fruit annual, solitary and nearly sessile; cup moderately deep, rather large (20 mm. in diameter), with thin somewhat loose blunt somewhat hairy scales; acorn (immature) depressed, largely included.

Andean region.

Specimens examined.—Columbia. Cuesta de Tolima, montana de Quindiu (*Bonpland*, the type, the specimen in the Berlin herbarium with one bud converted into an acornlike slender gall); without locality (*Linden, 1240*); Sta. Rosa, Antioquia (*Lehmann, cxiii*, 1884); Guadalupe, Antioquia (*Lehmann, 3886*, 1884, with fragile and drying attenuate leaf-tips).

QUERCUS HUMBOLDTII Bonpland.

Plates 272 and 273.

Quercus Humboldtii Bonpland in Humboldt & Bonpland, Plant. Aequinoct., vol. 2, p. 155, pl. 130, 1809.—Liebmann-Oersted, Chênes Amér. Trop., pl. 24.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 31.

Twigs rather stout (4–5 mm.), little fluted, glabrous, blackish with small light brown lenticels. Buds brown, somewhat pilose above, ovoid-fusiform, 3×6 mm. or more, their scales rather persistent on the developed axis. Leaves deciduous?, lance-elliptical, rather acute, somewhat rounded at base, entire, crisped and somewhat revolute, typically large (4×9–11 to 6–8×17 cm.), glossy, finely raised-reticulate and glabrous above, the somewhat lighter lower surface with sparing axillary tufts; veins some 12–15×2, forked and looping; petiole glabrescent, 2×scarcely 10 mm. Catkins: ♂, 50 mm. long, very sparsely white-hairy, rather closely flowered, the glabrous mucronate oblong anthers somewhat exserted, occasional pedicels elongated to 4 mm. Fruit annual, solitary on a glabrous stalk 5×10 mm.; cup umbonate saucer-shaped, very large (about 40 mm. in diameter), with coarse thin squarrose blunt somewhat yellowish-silky or gray scales; acorn subglobose, about 30 mm. long, very rusty-floccose, dark brown, fully half-included.

Andean region.

Specimens examined.—Columbia. Popayan (*Bonpland, 2083*, the type; *Hartweg, 1393; Lehmann, 2677*); "Nova Granata" (*Triana, 829, 830*); Serinta to Soata (*Linden, 1335*); Rio Cabrera (*Lehmann, 2359*); Laguneta, Quindiu, and Bogotá (*Goudot*, 1844); Cumbre de Cadura (*Karsten*); Rio Cauca (*Lehmann, 3560*); Antioquia (*Jervill; Kalbreyer, 1469; Lehmann, 3899*); District of Tolima (*?Apollinaire*, 1909); without locality (*Purdie, 666*, 1825). Cultivated at Kew in 1845 (Philadelphia Academy herbarium).

With elliptical leaves rounded at both ends, it becomes var. **Lehmanniana** Hieronymus in herb.: Sonson, Antioquia (*Lehmann, 7453*, the type, in the Berlin herbarium).

QUERCUS LINDENI A. de Candolle.

Plate 274.

Quercus Lindeni A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 32, 1864.

Twigs rather stout (4–5 mm.), little fluted, glabrous, somewhat glossy, blackish with small round pale lenticels. Buds rather glossy brown, glabrescent except at the end, ovoid, 3×5 mm. or more, their scales rather persistent below. Leaves subevergreen, elliptical or broadly lanceolate, aristately subacute, rounded at base, entire, slightly revolute, moderate (3–4×8–10 cm.), glossy, glabrous, and a little granular above, brown-lanose along the principal veins beneath; veins about 10×2, forked and looping; petiole glabrescent, scarcely 2×2 mm. Catkins ?. Fruit annual, solitary and nearly sessile, the round immature cup rather large (20 mm. in diameter), with thin blunt gray-hairy scales, apparently to be lax: acorn ?.

Andean region.

Specimens examined.—Columbia.—Province of Tunja, at 2,700 m. above sea level (*Linden, 1325*, 1843, the type).

RAPURAHUENSES.—Moderately large trees with rather stout glabrate twigs, ovoid buds, large broadly lanceolate rather long-petioled entire acuminate leaves finely reticulate above and glabrescent except in sheltered places beneath, and annual? short-stalked fruit with apparently glabrescent blunt appressed scales.—Central American region.

Leaves undulately crisped.....*Q. rapurahuensis.*

QUERCUS RAPURAHUENSIS Pittier.

Plate 275.

Quercus rapurahuensis Pittier in v. Seemen, Bull. Herb. Boissier, ser. 2, vol. 4, p. 654, 1904.

Twigs moderate (3–4 mm.), fluted, reddish with somewhat prominent small lenticels. Buds brown, glabrescent, rounded, 2 mm. in diameter. Leaves deciduous?, broadly lanceolate, acutish, somewhat acute or obliquely rounded at base, very undulate but not toothed, narrowly revolute, rather large (3.5–6×10–15 cm.), slightly glossy, glabrous above, somewhat stellate and with rusty tomentum in sheltered places beneath; veins about 10×2, alternately fine and evanescent, forking and irregularly looped; petiole glabrescent, 2×10–25 mm. Catkins ?. Fruit annual?, solitary and subsessile or several along a glabrous brown peduncle 2×20–30 mm.; cup subglobose, large (20 mm. in diameter), with carunculate appressed glossy brown scales: acorn ?.

Central American region.

Specimens examined.—Costa Rica. Copey (*Tonduz, 11795*, the type, *12231*).

URUAPANENSES.—Rather large trees with slender glabrous twigs, ovoid buds, rather large broadly lanceolate entire mostly rather long-petioled glabrate leaves finely raised-venulose above and coarsely veiny beneath, and biennial medium-sized fruit with blunt appressed canescent scales.—Mexican table-land and adjacent Western Sierra Madre.

Cup mostly inrolled at margin.....*Q. uruapanensis.*
Cup not inrolled.....*Q. trinitatis.*

Quercus uruapanensis n. nom.

Plates 276 and 277.

Quercus nitida Martens & Galeotti, Bull. Acad. Brux., vol. 10, part 1, p. 210, 1843.—Liebmann-Oersted, Chênes Amér. Trop., pl. 11.—Not *Q. nitida* Rafinesque, Alsographia Americana, p. 20, 1838.

Twigs rather slender (2–3 mm.), little fluted, soon glabrous and dark red with small pale lenticels. Buds rather glossy deep brown, more or less puberulent, ovoid, 2×3 mm. Leaves deciduous, lanceolate or oblanceolate to elliptical, somewhat acuminate, obliquely rounded or truncate to acute at base, entire or exceptionally rather sharply and deeply bristly-serrate above, slightly revolute, rather large (4–6 or 7×9–16 cm.), glossy and glabrous or somewhat

axillary-tufted beneath; veins about 10–12×2, somewhat forking and looped; petiole glabrous, 2×10–25 mm. Catkins?. Fruit biennial, solitary or paired on a stalk some 3×10 mm.; cup half-round, moderate (15 mm. in diameter), with thin appressed blunt canescent scales, its margin typically inrolled; acorn ovoid, 20 mm. long, one-third included.

Western Sierra Madre (and cordilleran?) region of Mexico.

Specimens examined.—Michoacan. Taretan and Uruapan, at 1,600 m. (*Galeotti, 121*, 1840, the type); Uruapan, at 1,300 m. (*Pringle, 8840*); Cerro Baldoquin (*Endlich, 1353*, a very thick-trunked tree 20 m. high, yielding excellent timber, called encino colorado). Oaxaca. S. Bartolo, Yauhtepec (*?Seler, 1630*); without locality (*Pringle, 11851*).

Quercus trinitatis n. sp.

Plate 277.

Twigs rather slender (2–3 mm.), somewhat fluted, glabrous, glossy red with small pale lenticels. Buds rather glossy brown, glabrous, ovoid, 2×3 mm. Leaves deciduous?, lanceolate, long-acute or acuminate, acute at base, entire, somewhat crisped, rather large (3–6 × 9–14 cm.), essentially glabrous, green and glossy on both faces; veins about 10–12×2, looped; petiole glabrous, 1×10–20 mm. Catkins: ♀, scarcely 10 mm. long, about 2-flowered at the end. Fruit biennial, on a peduncle some 4×10 mm.; cup deep-saucer-shaped, moderate (15 mm. in diameter), with thin appressed blunt gray scales; acorn ovoid, somewhat hoary, about one-third included.

Mexican table-land.

Specimens examined.—Trinidad, Hidalgo (*Pringle, 8888*, Sept. 14, 1904, the type).

RYSOPHYLLAE.—Moderate-sized trees, with somewhat thick glabrate twigs, ovoid-fusiform buds with somewhat persistent stipules, large lanceolate very short-petioled entire glabrous leaves impressed-veiny above and coarsely raised-veiny beneath, and biennial short-stalked fruit with thin rounded canescent scales.—Central American and eastern Sierra Madre regions.

Leaves acuminate, subcordately rounded at base, rather bullate between the veinlets beneath.....*Q. irazuensis.*
Leaves aristately long-acute, rather cordate or even auriculate, less bullate.....*Q. rysophylla.*

QUERCUS IRAZUENSIS Kuntze.

Plate 278.

Quercus irazuensis Kuntze, Revis. Gen. Plant, part 2, p. 641, 1891.

Twigs moderate (3–4 mm.), from brown-fleecy glabrescent. Buds glossy brown, at first brown-hairy, apparently elongating. Leaves deciduous, ovate to elliptical-lanceolate, rather bluntly acuminate, subcordately rounded at base, somewhat repand, very slightly revolute, rather large (4–5×8–17 cm.), glabrous and glossy, the even more polished lower face somewhat coarsely bullate-granular; veins about 10–12×2, conspicuously and often doubly looped; somewhat impressed above and, like the percurrent midrib and even the paler veinlets, very salient beneath; petiole glabrescent, 2×2 mm. Flowers and fruit?.

Central American region.—A tree 12 m. high.

Specimens examined.—Costa Rica. Volcan Irazu, at about 2,700 m. (*Kuntze, 2344*, June 24, 1874, the type, in the herbarium of the New York Botanical Garden, also to be seen at Kew).

QUERCUS RYSOPHYLLA Weatherby.

Plate 279.

Quercus rysophylla Weatherby, Proc. Amer. Acad., vol. 45, p. 423, 1910.

Twigs rather stout (4–5 mm.), fluted, quickly glabrate and from brown passing to gray with small pale lenticels. Buds rather glossy brown, glabrescent, acutely elongated, ovoid, 3×6 mm., with rather persistent stipules. Leaves falling as the new growth begins, lanceolate, aristately very long-acute, deeply cordate with closed sinus or auriculate, slightly undulate

narrowly revolute, large (4–7×14–20 cm.), glabrous, glossy especially beneath, the surface not granular; veins about 15–20×2, looped, the coarse reticulation impressed above and raised beneath; petiole glabrous, 2–3×5 mm. Catkins: ♂, 100 mm. long, fleecy, rather closely flowered, the glabrous anthers little exserted. Fruit biennial, the young cup with very thin appressed obtuse golden scales, browning at tip.

Eastern Sierra Madre region of Mexico.—A tree 8–15 m. high.

Specimens examined.—Sierra Madre above Monterey, Nuevo Leon (*Pringle, 2095, 10225–6*, Mar., 1906, the types, in the Gray herbarium, *10379*, July 1907).

ENDRESIAE.—Rather large trees, with rather stout at first tomentose twigs, moderate oblong rather short-petioled entire leaves, impressed-veiny above and rather finely raised-veiny and for a time very tomentose beneath, and biennial? stalked fruit, with thin blunt appressed canescent scales.—Central American region.

Leaves cordate, acute.....*Q. Endresi.*

Quercus Endresi n. sp.

Plate 280.

Twigs rather stout (5 mm.), somewhat fluted, buff, densely rusty-tomentose when young. Buds?. Leaves deciduous?, elliptical to lance-oblong, obtuse or emarginate to typically very acute or subacuminate, shallow-cordate, entire, slightly revolute, moderate (4×9–10 cm.), firm, glabrous and very glossy above, from closely rusty-stellate and dull becoming glabrous except for the floccose midrib, etc., and somewhat glossy beneath; veins about 10–15×2, rather low-branched but hardly looping, impressed above and prominent beneath, the midrib percurrent; petiole rusty-tomentose, 2×5–8 mm. Catkins: ♀, 15–30 mm. long, the stout rusty peduncle several-flowered above the middle. Fruit?.

Central American region.—A tree 10–15 m. high.

Specimens examined.—Costa Rica. Without data (*Endres*, the type, in the Vienna herbarium).

COSTARICENSES.—Moderate-sized trees with rather stout from fleecy glabrate twigs, rather large ovoid or elongated buds, sometimes with persistent stipules, medium-sized broadly elliptical or lanceolate mostly obtuse short-petioled entire leaves with the principal veins impressed above and glabrate or detachably fleecy in sheltered places and granular-bullate beneath, and annual short-stalked large fruit with thin somewhat loose rather glabrate scales; the abortive ovules lateral or basal as in white oaks.—Central American region.

Leaves mostly floccose beneath, deeply impressed-veiny above.....*Q. costaricensis.*
Leaves glabrescent, the veins little impressed.....f. *Kuntzei.*

QUERCUS COSTARICENSIS Liebmann.

Plates 281 to 283.

Quercus costaricensis Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 184.—Liebmann-Oersted, Chênes Amér. Trop., p. 25, pl. 24.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 32.

Twigs rather stout (3–5 mm.), little fluted, from densely rusty long-stellate becoming glabrous and blackish with small brown lenticels. Buds dull brown, somewhat hairy between the scales, ovoid, 3×5 mm. Leaves deciduous, elliptical-obovate, obtuse, rounded at base or somewhat cordate, entire, undulate, slightly revolute, rather small (4×6–8 cm.), thick, glabrous and glossy above, dull and more or less floccose in the axils or even persistently brown-fleecy beneath, both faces rather bullate-granular; veins about 8–10×2, often twice or thrice forked, deeply impressed above and prominent with low branches beneath; petiole glabrescent, 2×3 mm. Catkins: ♂, 60 mm. long, densely rusty-fleecy, closely flowered, the ellipsoid glabrous anthers little exserted. Fruit annual, solitary or paired on a glabrous peduncle 3×10–40 mm.; cup cuneately deep saucer-shaped, large (about 30 mm. in diameter), with thin rather squarrose blunt pale-fringed glabrous brown scales; acorn ovoid, or exceptionally elongated and 20–30 mm. long, included at the base only.

Central American region.—A large tree of the habit of *Q. oleoides*.

Specimens examined.—Costa Rica. Mt. Irazu, at 3,000–3,400 m. (*Oersted, 3465*, the type; *Hoffmann, 127, 129; Pittier, 871, 14120; Kuntze, 2352*); Cartago Volcan (*v. Warscewicz, 53, 275*); without locality (*Wendland, 658*); Azari (*Oersted, 1265*).

With cellular-pitted less impressed-veiny leaves glabrous except for long brown fleece in sheltered places beneath, it is f. **Kuntzei**, which occurs with the type: Costa Rica. Mt. Irazu (*Oersted; Wendland, 665; Hoffmann, 128; Pittier, 747; Kuntze, 2282*, the type); forest of Barba (*Tonduz, 1953*); without locality (*Huebsch*).

BENTHAMIAE.—Moderate-sized trees, with moderately slender glabrate twigs, ovoid buds, rather large lance-elliptical moderately petioled entire glossy glabrous leaves raised-venulose above, and annual rather large short-stalked fruit with thin rather close puberulent scales.—Central American region.

Potioles relatively long (15 mm.).....*Q. Benthami.*
Petioles short (5 mm.).....*Q. Tonduzii.*

QUERCUS BENTHAMI A. de Candolle.

Plate 284.

Quercus Benthami A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 29, 1864.—Liebmann-Oersted, Chênes Amér. Trop., pl. 22.

Twigs moderate (3 mm.), fluted, from yellowish-floccose glabrate, dark red with small prominent brown lenticels. Buds smooth and glossy, conical-ovoid, 2×3 mm. Leaves deciduous?, lance-elliptical, acute at both ends, entire or exceptionally aristately few-toothed, slightly revolute, moderate or rather large (3–4×7–10 or even 6×16 cm.), rather glossy, glabrous except for axillary tufts beneath; veins about 10×2, forking and looped, the veinlets finely raised on the upper surface; petiole scurfy, 1.5×15 mm. Catkins?. Fruit annual, solitary or paired on a glabrous stalk 3×10–20 mm.; cup umbonate-hemispherical, large (20–30 mm. in diameter), with thin appressed acuminate puberulent brown scales; acorn subglobose, 15 mm. long, more than half-included, brown-fleecy like the tips of the scales.

Central American region.—A tree 12–16 m. high.

Specimens examined.—Guatemala. Sta. Maria (*Hartweg, 563*, the type); Solala (*Lehmann, 1679*).

QUERCUS TONDUZII von Seemen.

Plate 285.

Quercus Tonduzii v. Seemen, Bull. Herb. Boissier, ser. 2, vol. 4, p. 656. 1904.

Twigs moderate (3–4 mm.), fluted, soon glabrous, from rather dull reddish becoming gray with rather prominent small lenticels. Buds light brown, more or less woolly above, prismatic-ovoid, 3×5 mm. Leaves deciduous?, oblanceolate, very acute at both ends, entire, undulate, revolute, moderate (3–4×9–10 cm.), glossy and glabrous on both faces or with sparing axillary tufts beneath; veins about 8–10×2, forking and looped; petiole more or less villous, or glabrescent, 2×5 mm. Catkins?. Fruit annual, solitary on a very short thick stalk; cup saucer-shaped, rather large (20 mm. in diameter), with thin rather close obtuse slightly hairy brown scales; acorn ovoid, 20 mm. long, covered at base only.

Central American region.

Specimens examined.—Costa Rica. Achiote, Poas (*Tonduz, 10788*, Nov., 1896, the type).

CRISPIFOLIAE.—Trees with rather large elongated-lanceolate petioled, thin, raised-venulose entire leaves.—Central American region.

Leaves crisped, long-acute.....*Q. crispifolia.*

Quercus crispifolia n. sp.

Plate 286.

Twigs and buds ?. Leaves deciduous ?, thin, narrowly lanceolate, very acute at both ends, aristate from the tip, entire, crisped, rather large (3–5 × 13–20 cm.), glabrous except along the midrib above, rather dull, scarcely paler beneath; veins about 20–25 × 2, often with one or more fainter intermediates, angularly looped near the margin; petiole glabrate, 6–12 mm. long. Flowers ?. Fruit biennial ?; cup ?; acorn ovoid, rather large (30 mm.), covered at base only.

Central American region.

Specimens examined.—Mexico. Finca Las Chicharras, Tapachula, Chiapas (*Reeves, 4*, 1918, the type).

Differing from all other species with comparable foliage in its relatively large acorns, resembling those of the northern *Q. maxima*.

PACHYPHYLLAE.—Trees with short-petioled large leathery oblanceolate entire glossy glabrous short-stalked leaves pinnately impressed above, and rather large fruit.—Central American region.

Leaves gradually very acute, sometimes subpanduriform.....*Q. incrassata.*

Quercus incrassata n. sp.

Plate 287.

Twigs and buds ?. Leaves evergreen ?, oblanceolate, aristately acute, rounded at base or shallowly cordate, entire with callous thickening of the margin, large (5–7 × 15–23 cm.), rather glossy, glabrous; veins about 25–30 × 2, forking and looped, the principal veins impressed above and very prominent beneath; petiole somewhat hairy, 2 × 5–10 mm. Catkins ?. Fruit annual ?, rather large; cup ?; acorn ovoid, 26 × 30 mm., covered only near the base.

Central American region.

Specimens examined.—Mexico. Finca San Juan las Chicharras, Tapachula, Chiapas (*Reeves, 7*, 1918, the type).

The acorns resemble those of the thin-leaved *Q. crispifolia*, and the foliage is suggestive in a way of *Q. Benthami* and its relatives, though shorter-stalked.

CITRIFOLIAE.—Medium-sized trees with rather slender scurfy or glabrate twigs, acutely ovoid buds, and medium-sized elliptical acute rather long-petioled glabrate leaves pinnately impressed above.—Central American region.

Leaves lance-elliptical, more or less acuminate.....*Q. citrifolia.*

QUERCUS CITRIFOLIA Liebmann.

Plate 288.

Quercus citrifolia Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 187.—Liebmann-Oersted, Chênes Amér. Trop., p. 26, pl. E.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 32.

Twigs moderate (3 mm.), fluted, quickly glabrate, blackish with more or less evident lenticels. Buds light straw-color, glabrous, elongated, ovoid, 2 × 3–4 mm. Leaves deciduous ?, elliptical, short-acuminate, rather round-based, entire, moderate (3–4 × 8–11 cm.), glabrous and somewhat glossy; veins about 8–10 × 2, somewhat looped near the margin; petiole soon glabrate, 2 × 10 mm. Flowers and fruit ?. The ovules are said by Oersted to be basal, as in *Q. costaricensis*.

Central American region.

Specimens examined.—Costa Rica. Mt. Irazu, at 2,600–2,900 m. (*Oersted, 6, 7, 3461*, the type); Copey (*Tonduz, 11697*); Cartago (*?Friedrichsthal, 1406, 1421; ?Scherzer, 1853*).

NECTANDRAEFOLIAE.—Rather large trees, differing from the Perseaefoliae in having the subsessile fruit moderately large with thick-walled somewhat septately divided acorn and thickened scales, and the somewhat pinnately impressed leaves scarcely venulose above.—Eastern Sierra Madre region of Mexico.

Leaves obovate-oblong, granular beneath.....*Q. nectandraefolia.*
Leaves elliptical, smooth beneath.....*Q. lingvaefolia.*

QUERCUS NECTANDRAEFOLIA LIEBMANN.

Plate 289.

Quercus nectandraefolia Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 175.—Liebmann-Oersted, Chênes Amér. Trop., p. 23, pl. 5.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 71.

Twigs rather slender (2–3 mm.), fluted, rather persistently dingy-tomentose through the first season, olive with very inconspicuous lenticels, becoming blackish with gray epidermal reticulation the second year. Buds brown, glabrescent, ovoid, 2×3 mm. Leaves deciduous?, elliptical, obtuse, rather acute at base to subcordate, entire, crisped, revolute, moderate (3–5×9–12 cm.), glabrous and glossy on both faces, the lower somewhat paler and granular; veins about 12×2, forking and looped; petiole 1.5×2 mm., glabrescent. Catkins?. Fruit annual, short-stalked; cup half round, large (25–30 mm. in diameter), with tuberculate appressed blunt canescent scales; acorn ovoid, thick-walled with intruded septa, half-included.

Eastern Sierra Madre region of Mexico.

Specimens examined.—Totutla, at 1,000–1,500 m. (*Liebmann, 114*, Aug., 1841, *100=3509*, taken as the type); Pic d'Orizaba, at 3,200 m. (*Galeotti, 134*); Mirador (*Liebmann, 107, 111=3511*) Oct., 1841, with the leaves from elliptical to falcately lanceolate.

QUERCUS LINGVAEFOLIA Liebmann.

Plate 290.

Quercus lingvaefolia Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 180.—Liebmann-Oersted, Chênes Amér. Trop., p. 25, pl. E.

Q. linguaefolia A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 70, 1864.—Oersted, Bidrag Kundsk. Egefamil., pl. 3, pl. 4, f. 1–8.

Twigs moderate (3–4 mm.) fluted, transiently rusty villous-tomentose, becoming rather glossy gray. Buds apparently brown and glabrescent, ovoid, about 2×3 mm. Leaves deciduous?, elliptical, obtuse to acute, usually distinctly cordate, entire, slightly revolute, moderate (3–4×6–11 cm.), glossy, glabrous or a little puberulent along the midrib above, somewhat furfuraceous in sheltered places beneath; veins about 12×2, usually with fainter intermediates, repeatedly forking, looped; petiole tomentose or glabrescent, scarcely 5 mm. long. Catkins: ♂, 50 mm. long, somewhat floccose, rather loosely flowered, the glabrous ellipsoid anthers scarcely exserted. Fruit biennial?, usually paired at end of a peduncle 1.5×15 mm.; cup deep-saucer-shaped, rather small (12 mm. in diameter), with thin appressed blunt tomentose scales; acorn ovoid, 15 mm. long, covered at base only.

Cordilleran region of Mexico.

Specimens examined.—Oaxaca. Cuesta de Lachopa, at 1,600–1,900 m. (*Liebmann, 100–102, 3506*, June, 1842, the types); Aguas Santas (*?Liebmann*, Nov., 1841); Choapam (*Nelson, 871*).

PERSEAEFOLIAE.—Rather large trees with moderately slender tomentose or glabrate twigs, ovoid buds, moderately large elliptical or oblanceolate-obovate short-petioled venulose entire leaves glabrescent or with some tomentum beneath and puberulent along the midrib above, and annual short-stalked or moderately peduncled medium-sized fruit with thin appressed rather obtuse slightly pubescent scales.—Central American and eastern Sierra Madre regions.

Leaves attenuate or even acute at base. Central American.
- Oblanceolate, more or less acute ..... *Q. sapotaefolia.*
- Obovate, obtuse ..... *Q. bumelioides.*

Leaves mostly rounded at base. Mexican.
- Cup relatively large (12 mm.) ..... *Q. perseaefolia.*
- Cup small (7 mm.) ..... f. *microcarpa.*

QUERCUS SAPOTAEFOLIA Liebmann.

Plate 291.

Quercus sapotaefolia Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 185.—Liebmann-Oersted, Chênes Amér. Trop., p. 26.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 79.

Twigs slender (2 mm.), fluted, from dingy-scurfy glabrescent, reddish with minute pale lenticels. Buds rather glossy brown, glabrous, round-ovoid, 2×3 mm. Leaves deciduous,

oblanceolate-elliptical, obtuse, the narrowed base rather rounded, entire or slightly repand, narrowly revolute, moderate (2–4×7–14 cm.), glossy and glabrous on both faces; veins about 10–12×2, forked and looping, with little-raised venulation; petiole glabrous, 2×2–3 mm. Flowers and fruit?.

Central American region.

Specimens examined.—Costa Rica. Cuesta de Incensio (*Skinner, 6*, the type, in the Kew herbarium).

QUERCUS BUMELIOIDES Liebmann.

Plate 291.

Quercus bumelioides Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 188.—Liebmann-Oersted, Chênes Amér. Trop., p. 26.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 75.

Twigs rather slender (2–3 mm.), fluted, glabrous, buff with rather prominent lenticels. Buds light brown or straw-color, glabrous, rounded, 2–3 mm. in diameter, for a time with persistent stipules. Leaves deciduous, elliptical-oblanceolate, obtuse and mostly emarginate, typically acute at base, entire, moderate (3–4.5×7–10 cm.), glossy and glabrous or with some axillary tufts beneath; veins about 8–9×2, forked and looping, with little-raised reticulation; petiole glabrous, red, about 1.5×6 mm. Catkins: ♂, 40 mm. long, quickly glabrous, at length rather openly flowered, the short glabrous anthers included, or little exserted.

Central American region.

Specimens examined.—Panama. Hacienda de Boquetes, Veraguas (*Seemann*, Feb., 1849, taken as the type, in the Kew herbarium); Maume and Gorgone (*Wagner*, Jan., 1858). Guatemala. Without locality (*Friedrichsthal*, at Kew).

Though no collector, locality or type is cited by Liebmann, and a specimen of what is here called *Q. costaricensis Kuntzei* occurs at Copenhagen as representing the present species, the sheet at Kew cited here, named by Liebmann, and of the Hookerian herbarium, so exactly fits his description as to warrant its designation as the type.

QUERCUS PERSEAEFOLIA Liebmann.

Plates 292 and 293.

Quercus perseaefolia Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 188.
Q. elliptica Liebmann-Oersted, Chênes Amér. Trop., pl. D, 1869.—Not *Q. elliptica* Née.

Twigs rather slender (2–3 mm.), fluted, glabrescent, with small rather conspicuous gray lenticels. Buds glabrate, ovoid, 2×3 mm. Leaves deciduous, oblanceolate-elliptical, obtuse, rounded at base, entire, slightly revolute, moderate (3–5.5×6–12 cm.), glossy, glabrate; veins about 10–12×2, forking and somewhat looped; petiole about 3 mm. long, glabrescent. Catkins?. Fruit annual, in subsessile pairs; cup turbinate, moderate (12 mm. in diameter), with thin appressed somewhat canescent scales; acorn oblong, pubescent, about one-third included.

Eastern Sierra Madre region of Mexico.

Specimens examined.—Hacienda de Jovo (*Liebmann, 98, 99, 3476*, May, 1841, the types); San Bartolomé (*Liebmann, 108–9, 113, 3510*); Aguas Santas (*Liebmann*, Nov., 1841); Huatusco (*Ghiesbreght, 118, 119, 122, 129*).

With minute fruit only 7 mm. in diameter it is *f.* **microcarpa,** occurring with the Liebmann collections (*no. 98*, pp.), and collected in the same locality by Galeotti (*no. 112*) and Ghiesbreght (*no. 115*).

OAJACANAE.—Rather large trees with rather stout to moderately slender rather persistently tomentose or scurfy twigs, ovoid buds, moderately large rather oblanceolate or obovate blunt or acuminate short-petioled entire leaves, glabrescent or somewhat puberulent and impressed-veiny above and glabrescent or with some tomentum beneath, and annual more or less stalked medium-sized fruit with thin appressed obtuse more or less hairy scales.—Mexican Sierras and Cordillera.

Petiole slightly elongated (5 mm.)
  Leaves somewhat tomentose, blunt.....*Q. pubinervis.*
  Leaves somewhat scurfy, pointed.....*Q. oajacana.*
Petiole very short (scarcely 3 mm.).....*Q. botryocarpa.*

QUERCUS PUBINERVIS Martens and Galeotti.

Plate 294.

Quercus pubinervis Martens & Galeotti, Bull. Acad. Brux., vol. 10, part 1, p. 211, 1843—Oersted, Bidrag Kundsk. Egefamil. (Skr. Vidensk. Selsk., vol. 9), pl. 4, f. 9–12.

Twigs rather slender (2–3 mm.), more or less fluted, reddish- or gray-tomentose. Buds red-brown, glabrate, ovoid, 2×3 mm. Leaves deciduous, elliptical-oblanceolate to ovate-lanceolate, very obtuse, rounded at base, entire or somewhat undulate, slightly revolute, moderate (3.5–5×8–12 cm.), glossy, glabrate except for the more or less puberulent midrib above and some fleeciness in sheltered places beneath; veins about 10×2, forking and looped; petiole 3 mm. long, tomentose. Catkins ?. Fruit annual, paired at end of a short peduncle; cup turbinate, moderate (12–15 mm. in diameter), with thin appressed blunt scales brown by abrasion; acorn oblong, pubescent, about one-third included.

Eastern Sierra Madre region of Mexico.—A tree 15–23 m. high.

Specimens examined.—Mt. Orizaba, at 3,200 m., but noted in the original text as in the forests of Santiago, Huatusco, and Coscomatepec, at 1,300–2,000 m. (*Galeotti, 4*, the type, *134*.).

QUERCUS OAJACANA Liebmann.

Plate 294.

Quercus oajacana Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 178.—Liebmann-Oersted, Chênes Amér. Trop., p. 24, pl. 23.—A. de Candolle in de Candolle, Prodromus. vol. 16, part 2, p. 79.

Q. salicifolia oajacana Wenzig, Jahrb., K. Bot. Gart. Berlin, vol. 3, p. 207, 1884.

Twigs moderate (3 mm.), fluted, densely yellow scurfy-tomentose or by abrasion reddish. Buds red-brown, somewhat hairy, ovoid, 2×3 mm. Leaves evergreen, lance-elliptical, acute, round-based, entire or somewhat undulate, slightly cartilaginous-revolute, moderate (2.5–4×8–10 cm.), glossy and glabrous above except for the puberulent midrib, duller and loosely stellate beneath; veins about 12×1, with frequent evanescent intermediates, branched and looping, the venulation little prominent; petiole yellow-tomentose, 2×5 mm. Catkins ?. Fruit annual, toward the end of a tomentose peduncle 2×15 mm.; cup rather shallow and small (12 mm. in diameter) with thin appressed blunt canescent or by abrasion brown scales; acorn ovoid, 15 mm. long, covered at base only.

Cordilleran region of Mexico.

Specimens examined.—Tanetze to Talea, Oaxaca, at 900 m. (*Galeotti, 108*, the type; seen only at Kew, and, as from Jalapa, in the Vienna herbarium).

Quercus botryocarpa n. sp.

Plate 295.

Twigs rather stout (3–5 mm.), little fluted, from yellow scurfy-tomentose becoming glabrous and gray the second year with crowded prominent lenticels. Buds rather dull brown, puberulent, ovoid, 2×3 mm. Leaves evergreen, thin but hard, elliptical, very obtuse to acute or acuminate, rounded at base or shallowly cordate, revolute, rather large (3.5 or 4–7 or 8×8–12 cm. or more), glossy, glabrous except for some scurf along the midrib above and axillary tufts beneath; veins about 12–15×2, often with several evanescent intermediates, repeatedly forking and irregularly looped, with impressed reticulation above; petiole glabrescent, scarcely longer than thick. Catkins ?. Fruit biennial, crowded along a glabrous stalk 3×25–30 mm.; cup saucer-shaped, moderate (15 mm. in diameter), with thin appressed blunt somewhat ashen scales; acorn ovoid, silky-scurfy, covered at base only.

Western Sierra Madre region of Mexico.

Specimens examined.—Foothills near Pedro Paulo, Tepic (*Rose, 1971*, Aug. 3, 1897, the type in the U. S. National herbarium, as sheet no. *300863*).

SYNTHETICAE.—Moderate-sized trees with slender glabrate twigs, rounded buds, rather large oblanceolate entire or crenate short-petioled glabrous leaves finely venulose above, and annual moderate elongated fruit with keeled appressed rather pointed canescent scales.—Eastern Sierra Madre region of Mexico.

Leaves entire..... *Q. synthetica.*
Leaves crenately shallow-lobed..... v. *crenifolia.*

Quercus synthetica n. sp.

Plates 296 and 297.

Quercus Oerstediana Liebmann, in herb.—Not *Q. Oerstediana* R. Brown, Campst.

Twigs rather slender (2–3 mm.), fluted, glabrous, dull reddish brown with rather prominent light brown lenticels. Buds rounded, glabrate. Leaves deciduous ?, elliptical-oblanceolate, bluntly short-acuminate, acute at base, entire, somewhat crisped, large (6–7×16 cm.), rather glossy, glabrous except for some axillary tufts on the paler lower surface; veins about 12–14×2, looped; petiole glabrous, 2×10 mm. Catkins ?. Fruit annual, on a peduncle some 2×20 mm.; cup round or rather turbinate, moderate (15 mm. in diameter), with somewhat thickened appressed scales blackish when abraded; acorn ellipsoid, smooth and glossy, 30 mm. long, covered at the base only.

Eastern Sierra Madre region of Mexico.

Specimens examined.—Huatusco (*Ghiesbreght, 121*, 1842, the type, as *Q. Oerstediana* Liebmann in herb.). In the type locality it also occurs in a form—var. **crenifolia**—with shorter more obovate crenately shallow-lobed leaves 4–7×9–12 cm., with petiole scarcely 5 mm. long (*Ghiesbreght, 117*, in the herbarium of the Muséum d'Histoire Naturelle at Paris, where, as in the Copenhagen herbarium, the type number occurs).

TOTUTLENSES.—Moderate-sized trees with slender for a time scurfy twigs, fusiform buds, small oblong obtuse entire slender-petioled glabrous leaves finely venulose above, and small biennial short-stalked fruit with thin appressed glabrescent scales.—Eastern Sierra Madre region of Mexico.

Leaves elliptical-oblong ..... *Q. totutlensis.*

QUERCUS TOTUTLENSIS A. de Candolle.

Plate 297.

Quercus totutlensis A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 62, 1864.—Liebmann-Oersted Chênes Amér. Trop., pl. 16.

Twigs slender (2 mm.), fluted, soon glabrous, from brown becoming gray with rather evident small lenticels. Buds rather glossy light brown, glabrous, somewhat prismatically ovoid-conical, 2×5 mm. Leaves deciduous, narrowly elliptical or slightly widened upwards, very obtuse, mostly rounded at base, entire, slightly revolute, rather small (1.5–2.5×6–8 cm.), glabrous and glossy above, pale, duller and sometimes a little hairy, at least in the axils, beneath; veins about 8×2, low-forking and somewhat looped; petiole glabrescent, 1×6–8 mm. Catkins: ♂, 40 mm. long, sparingly villous, rather closely flowered, the glabrous oblong anthers little exserted; ♀, 5–10 mm. long, few-flowered, sometimes from slender nearly leafless shoots which then resemble willow catkins. Fruit biennial, solitary or paired on a short stalk; cup half-round, small (8 mm. in diameter), with thin appressed rather acute glabrescent brown scales; acorn acute, rounded, more than half-included.

Eastern Sierra Madre region of Mexico.

Specimens examined.—Totutla, V. C. (*Liebmann, 115, 3568*, the type, *217*, Apr., 1842); without precise locality (*Linden, 1052*).

PARVIGLANDES.—Moderately large trees with rather slender glabrate twigs, subfusiform buds, medium-sized subelliptical entire rather short-petioled glabrous little-veiny leaves, and annual small fruit (so far as known) with blunt appressed glabrate scales.—Central American region.

Petioles short (scarcely 5 mm.); buds small.
  Leaves elliptic.
    Acorns short-stalked ..... *Q. parviglans.*
    Acorns several on a long stalk ..... f. *polycarpa.*
  Leaves narrowly oblong ..... f. *Tejadana.*
  Leaves elliptic-oblong ..... *Q. apanecana.*
Petioles longer (10 mm.); buds elongated ..... *Q. gemmata.*

QUERCUS PARVIGLANS Trelease.

Plates 298 and 299.

Quercus parviglans Trelease, Proc. Amer. Philos. Soc., vol. 54, p. 8, 1915.

Quercus microcarpa Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 184.—Liebmann-Oersted, Chênes Amér. Trop., p. 26, pl. 6.—Not *Q. microcarpa* Lapeyrouse, Hist. Abr. Pl. Pyr., p. 582, 1913; nor de Morogues, Mém. Soc. Agr. etc., d'Orléans, vol. 50, p. 51, 1877.

Q. elliptica microcarpa A de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 71, 1864, as to Guatemala.

Twigs rather slender (2–3 mm.), fluted, soon glabrous, reddish brown with small rather prominent brown or pale lenticels. Buds rather light dull brown, glabrescent, ovoid, scarcely 2×3 mm. Leaves deciduous, elliptical, very obtuse to acute, rounded at base, entire, crisped slightly and revolute, moderate (2.5–4.5×7–10 cm.), slightly glossy, caducously stellate-fleecy but glabrescent except in sheltered places, the lower surface somewhat whitened; veins about 10×2, forking and looped; petiole more or less stellate-scurfy, about 1×5 mm. Catkins ?. Fruit annual, typically paired on a peduncle 2×5 mm.; cup subumbonate-saucer-shaped, small (scarcely 10 mm. in diameter), with thin appressed small blunt scales at length glossy light brown; acorn oblong-ovoid, 8–10 mm. long, scarcely one-fourth included.

Central American region.

Specimens examined.—Guatemala. Without locality (*v. Warscewicz, 8*, the type, as of *Q. microcarpa*); Barrancas near Guatemala City (*Hayes*, July, 1860, with leaves ranging into bluntly oblanceolate, and occasional fruiting peduncles 15–20 mm. long); Eureka (*Trelease, 55*); Purulha (*Maxon & Hay, 3372*); Salama (*Cook, 236*), Salama to Purulha (*Cook, 291*, f. **polycarpa**, with numerous acorns distributed on a peduncle 20–30 mm. long); Alotepeque (*Tejada, 209*), f. **Tejadana**, with small oblong leaves scarcely 1.5×5 cm., its ♂ catkins rather short (50 mm.) and densely flowered, slightly fleecy, the oblong anthers scarcely exserted.

Quercus apanecana n. sp.

Twigs rather slender (2 mm.) fluted, glabrous, somewhat glossy light brown with small but prominent concolorous lenticels. Buds rather dull light brown, glabrate, apparantly ovoid and scarcely 3 mm. long. Leaves evergreen, elliptic-oblong, rounded at both ends, entire, revolute, thick and firm, moderate (1.5–2. 5×6 cm.), rather glossy and glabrous, somewhat raised-reticulate above, and beneath with prominent veins, these about 9×2, forking and somewhat looped; petiole glabrous, about 5 mm. long. Flowers: ♀ paired on light brown stalks scarcely 5 mm. long, with glossy light brown glabrous blunt scales.

Central American region.—A large tree, called roble encino, used for tanning.

Specimens examined.—El Salvador. Forest of the Sierra de Apaneca, Ahuacapan (*Standley 20187*, the type as sheet *1136043* in the United States National Herbarium).

Quercus gemmata n. sp.

Plate 299.

Twigs rather slender (1–3 mm.), fluted, soon glabrous, glossy red-brown with very numerous conspicuous small white lenticels. Buds rather dull light brown, glabrate, fusiform-ovoid, 3–4×7–10 mm. Leaves elliptical, very obtuse, acute at base, entire, somewhat crisped and revolute, moderate (2.5–3.5×8–10 cm.), glossy and glabrous on both faces; veins about 12×2, forking but scarcely looped, with very indistinct venulation; petiole glabrescent, 1.5×10–15 mm. Flowers and fruit ?.

Central American region.

Specimens examined.—El Salvador. Volcan de San Salvador, at 2,200 m. (*Niederlein*, Jan. 9, 1898, the type, in the Berlin herbarium).

GUATIMALENSES.—Moderately large trees with moderately slender scurfy or glabrate twigs, ovoid buds, moderately large and long-petioled broadly lanceolate glabrescent or scurfy leaves somewhat pinnately impressed above, and annual ?, rather small short-stalked fruit with slender acorns and turbinate cup with thin appressed blunt tomentose scales.—Central American region.

Leaves rounded at base, subacute, very veiny beneath.....*Q. guatimalensis.*
Leaves cordate, very long-acute, little veiny beneath.....*Q. correpta.*

QUERCUS GUATIMALENSIS A. de Candolle.

Plate 300.

Quercus guatimalensis A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 78, 1864.
Q. turbinata Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 186.—Liebmann-Oersted, Chênes Amér. Trop., p. 26.—Not *Q. turbinata* Blume, Bijdr. Fl. Ned. Ind., p. 523, 1825.

Twigs rather slender (2–3 mm.), fluted, canescent becoming glabrous and dark with small pale lenticels. Buds brown, glabrescent, round-ovoid, 1×2 mm. Leaves deciduous, elliptical to ovate-lanceolate, rather acute, mostly unequally rounded at base, entire or sinuate, slightly revolute, rather large (3–5×10–14 cm.), slightly glossy, nearly glabrous, or somewhat persistently scurfy or with axillary tufts beneath; veins about 10–12×2, rather irregularly forked and looped, the venation much raised beneath; petiole mostly puberulent, 2×5–10 or 15 mm. Catkins ?. Fruit annual ?, mostly solitary and nearly sessile; cup deep goblet-shaped, small (10 mm. in diameter), with thin appressed blunt very tomentose scales; acorn oblong, 12 mm. long, half-included.

Central American region.

Specimens examined.—Guatemala. Without locality (*v. Warscewicz, 37*, the type; S. Lucas, Zacatepequez (*??Smith, 2186*, flowering specimens with the oblong young leaves thinly and transiently gray-tomentose, mucronate and entire or setaceously few-toothed above; and cobwebby staminate catkins 50 mm. long, rather loosely flowered, with oblong mucronate glabrous scarcely exserted anthers).

Quercus correpta n. nom.

Plate 300.

Quercus acutifolia microcarpa A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 67, 1864.

Twigs slender (about 2 mm.), little fluted, glabrate. Buds acutely ovoid, glabrous, 2×3 mm. Leaves deciduous, ovate-lanceolate, long-acute, typically cordate, entire, minutely revolute, very low-reticulate, moderate (2.5–3×8–9 cm.), slightly glossy, glabrate, or minutely scurfy or a little floccose beneath; veins about 10×2, obscurely forked and looped; petiole glabrous, about 2×8 mm. Catkins ?. Fruit annual ?, solitary and nearly sessile; cup shallowly turbinate, very small (scarcely 8 mm. in diameter), with thin appressed blunt nearly glabrous scales; acorn oblong, 12 mm. long, scarcely one-third included.

Central American region.

Specimens examined.—Guatemala. Without locality (*v. Warscewicz, 25*, the type, in the Boissier herbarium).

SALICIFOLLÆ—Rather large trees with slender glabrescent twigs, mostly narrowly lanceolate or willow-like aristately acute entire rather short-petioled venulose leaves glabrate except for some axillary tufts beneath, and annual small subsessile fruit with blunt somewhat keeled appressed canescent scales.—Western Sierra Madre region of Mexico.

Leaves large and crisped.....*Q. acapulcensis.*
Leaves small and flat.
Acorn subglobose, half-included.....*Q. salicifolia.*
Acorn oblong, covered at base only.....*Q. tahuasalana.*

Quercus acapulcensis n. sp.

Plate 302.

Twigs slender (2 mm.), fluted, more or less transiently scurfy. Buds dull brown, ovoid, about 2×3 mm. Leaves deciduous, oblanceolate, acute, mostly rather rounded at base, at flowering time small (2.5×10 cm.) but in maturity rather large (4–5×13–16 cm.), entire, crisped, glossy, glabrous except for conspicuous axillary tufts beneath, the veinlets rather sharply raised on both faces; petiole glabrate, very short (2–5 mm.). Catkins: ♂, 80–100 mm. long, glabrescent, closely flowered, the round-ellipsoid slightly cobwebby anthers exserted. Fruit ?.

Western Sierra Madre region of Mexico.

Specimens examined.—Acapulco (*Palmer, 334*, the type).

QUERCUS SALICIFOLIA Née.

Plate 301.

Quercus salicifolia Née, Anal. Cienc. Nat., vol. 3, p. 265, 1801.—Liebmann-Oersted, Chênes Amér. Trop., pl. 20.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 30.
Q. mexicana glabrata Seemann, Bot. Herald, p. 332 [probably 1854 or 1855].
Q. castanea glabrata A. de Candolle in de Candolle, Prodromus, vol.16, part 2, p. 72, 1864.

Twigs slender (2 mm.), fluted, quickly glabrous. Buds short-ovoid, about 1×2 mm. Leaves deciduous, lanceolate, aristately long-acute, typically rounded at base, entire, moderate (2–4×10–15 cm.), glabrous; veins about 12×2, looped, the veinlets rather sharply raised on both faces; petiole glabrate, scarcely 1.5×5 mm. Catkins: ♂, 80–100 mm. long, glabrescent, closely flowered, the very broadly ellipsoid slightly cobwebby anthers exserted. Fruit (judging from Lange's sketch of the type) annual, paired, nearly sessile; cup hemispherical-turbinate, rather small (12 mm. in diameter), with close scales. Acorn subglobose, half-included.

Western Sierra Madre region of Mexico; the type from Acapulco?

Specimens examined.—Without locality (*Seemann, 1974*, the type of *Q. mexicana glabrata* and also of *Q. castanea glabrata*); Cerro Azul, Morelia, Michoacan (*Arsène 6031*).

Quercus tahuasalana n. sp.

Plate 302.

Twigs slender (1–2 mm.), fluted, transiently scurfy, brown. Buds rather glossy brown, glabrescent, round-ovoid, 1×2 mm. Leaves deciduous?, linear-lanceolate, acute at both ends, entire, somewhat crisped and minutely subrevolute, small (1.5–2×8–11 cm.), slightly glossy, glabrous except for occasional axillary tufts beneath; veins about 15–20×2, frequently with several faint evanescent intermediates, branched and looping; petiole from scurfy glabrescent, 1×5 mm. Catkins: ♂, 50 mm. long, nearly glabrous, rather closely flowered, the hairy ellipsoid anthers exserted. Fruit annual, solitary, sessile; cup deep-saucer-shaped, small (scarcely 10 mm. in diameter), with thin appressed very obtuse scales hoary below; acorn elongated and pointed, 15 mm. long, covered at base only.

Western Sierra Madre region of Mexico.—A tall tree yielding structural wood, called encino prieto.

Specimens examined.—El Tahuasal, at 800 m. (*Langlassé, 217*, June 18, 1898, the type); Hacienda Coahuayula, Michoacan (*Emrick, 108*).

LAURIFOLIAE.[10]—Usually trees, sometimes of large size, with rather slender glabrous twigs, conical-ovoid buds, usually small elliptical and entire short-petioled venulose leaves glabrous at least above, and biennial subsessile rather small fruit with shallow cup with small thin appressed scales.—Atlantic region of the United States, chiefly southwards.

Leaves persistently gray-stellate beneath.
  Subevergreen, firm.....×*Q. sublaurifolia.*
  Thin and deciduous.
    Pubescence fine and close. Southern.
      Shrub.....*Q. pumila.*
      Trees.
        Leaves entire, willow-like.....*Q. cinerea.*
        Leaves similar but often toothed.....f. *dentato-lobata.*
        Leaves often larger and unequally lobed.....×*Q. ludoviciana.*
        Leaves large, elliptical.....×*Q. dubia.*
        Leaves lanceolate to subrhombic or 3-lobed.....×*Q. Cocksii.*
    Pubescence rather loose and soft. Northern trees.
      Leaves entire.....*Q. imbricaria.*
      Leaves in part somewhat toothed.....f. *spinulosa.*
      Leaves somewhat 3- or 4-lobed.....×*Q. tridentata.*
Leaves rusty-stellate beneath, subelliptical.....×*Q. oviedoensis.*

[10] This is primarily the subgenus Phellodrys of Rafinesque, Alsographia Americana, p. 26, 1838, though he places also in it *Q. virens* [*virginiana*], the Old-World *Q. infectoria*, etc.

Leaves glabrate or at most with axillary tufts beneath.
  Subevergreen, firm.
    Elongated, exceptionally cuneate-obovate.
      Characteristically lanceolate and entire and acute.
        Rather large (7 cm. or more long).....*Q. laurifolia.*
        Small (scarcely 5 cm. long).....f. *arenaria.*
      Characteristically lanceolate but 3-lobed at apex.....f. *tridentata.*
      Obovate-cuneate, the apex undulate or shallow-lobed.....f. *obovatifolia.*
      Characteristically dilated upwards and often blunt.
        Entire.
          Oblanceolate-obovate.....f. *obtusa.*
          Rhombic-oblanceolate.....f. *rhombica.*
          Three-toothed or 3-angled at tip.....f. *dentata.*
        Variously entire or unequally triangular-lobed; buds large.....×*Q. Mellichampi.*
    Round-obovate.
      Small (scarcely 3×5 cm.).....*Q. myrtifolia.*
      Distinctly larger.....f. *ampla.*
  Deciduous, thin.
    Elliptical-oblong.
      Entire.....×*Q. Rudkini.*
      Sinuate.....×*Q. Walteriana.*
    Lanceolate or narrowly oblong, moderate.
      Entire.....*Q. Phellos.*
      Often toothed.....f. *microcarpa.*
    Elliptical, somewhat toothed.....f. *latifolia.*
    Oblanceolate, sometimes short-lobed.....×*Q. subfalcata.*
    Of many forms, from elliptical to rhombic-lanceolate, often large.....*Q. nigra hemisphaerica.*
Leaves and twigs for a time cobwebby.....*Q. Phellos arachnoidea.*

QUERCUS PUMILA Walter.

Plate 303.

Quercus pumila Walter, Fl. Carol., p. 234, 1788.—Michaux, f., Hist. Arb. Amér., vol. 2, pl. 15; N. A. Sylva, vol. 1, pl. 17.—Sargent, Silva, vol. 8, pl. 404.—Trelease, Proc. Amer. Philos. Soc., vol. 51, pl. 12.
Q. humilis Walter, Fl. Carol., p. 234, 1788.
Q. Phellos pumila Michaux, Hist. Chênes Amér., pl. 13, 1801.
Q. sericea Willdenow, Sp. Pl., vol. 4, part 1, p. 424, 1805.
Q. Phellos humilis Pursh, Fl., vol. 2, p. 625, 1814.
Q. cinerea pumila Curtis, Rep. Geol. Surv. N. Carol., vol. 3, p. 37, 1860.
Q. cinerea nana A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 74, 1864.
Q. cinerea humilis A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 74, 1864.
Q. pumila sericea Engelmann, Trans. Acad. St. Louis, vol. 3, p. 384, 1876.

Southern Atlantic region of the United States, from South Carolina to Florida; the type from the Carolinas.—Exceptional among the black oaks of the Atlantic region in the annual maturation of its fruit.—Called running oak.

QUERCUS CINEREA Michaux.

Plate 303.

Quercus cinerea Michaux, Hist. Chênes Amér., pl. 14, 1801.—Michaux, f., Hist. Arb. Amér., vol. 2, pl. 14; N. A. Sylva, vol. 1, pl. 16.—Dippel, Handb. Laubholzk., vol. 2, p. 105, f. 47.—Britton & Shafer, N. A. Trees, f. 257.—Lewis, Trees of Texas, f. 22.—Trelease, Winter Botany, p. 29, f. 5.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 73.
Q. Phellos brevifolia Lamarck, Encycl., vol. 1, p. 722, 1783.
Q. Phellos sericea Aiton, Hort. Kew., vol. 3, p. 354, 1789.—Loudon, Arbor. Brit., vol. 3, f. 1773.
Q. Phellos latifolia Castiglioni, Viag. Stati Uniti, vol. 2, p. 345, 1790.
Q. Phellos β Smith & Abbot, Insects Ga., p. 103, pl. 52, 1797.
?*Q. verrucosa* Rafinesque, Alsog. Amer., p. 26, 1838.
Q. brevifolia Sargent, Silva, vol. 8, p. 171, pl. 431, 1890; Manual, f. 203.—Trelease, Proc. Amer. Philos. Soc., vol. 51, pl. 12.

Southern Atlantic region of the United States, in the coastwise States from Virginia to Florida and Texas; the type from the Carolinas.—The blue jack, sand jack, or cinnamon oak; also called upland or high-ground willow oak, and shin oak.

A slightly dentate form from Florida (*Rugel*) is f. *dentato-lobata* A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 73, 1864.

Hybrids are: ×*Q. Ashei* Trelease, Proc. Am. Phil. Soc., vol. 56, p. 48, 1917, with *laevis* (*Q. cinerea*×*Catesbaei* Ashe, Journ. Elisha Mitch. Sci. Soc., vol. 11, p. 88, 1894); ×*Q. sub-laurifolia* Trelease, Proc. Am. Philos. Soc., vol. 56, p. 48, 1917 (*Q cinerea*×*laurifolia* Ashe, Journ. Elisha Mitch. Sci. Soc., vol. 11, p. 89, 1894, and apparently *Q. atlantica* Ashe, Proc. Soc. Amer. Foresters, vol. 11, p. 88, 1916); ×*Q. carolinensis* Trelease, *l. c.*, p. 48, 1917 (*Q. cinerea*×*nigra* [*marilandica*] Ashe, *l. c.*, p. 91, 1894); ×*Q. caduca* Trelease. *l. c.*, p. 48, 1917 (*Q. cinerea*×*aquatica* [*nigra*] Ashe, *l. c.*, p. 90, 1894); ×*Q. podophylla* Trelease, *l. c.*, p. 48, 1917 (×*Q. petiolaris* Ashe, *l. c.*, p. 90, 1894, not *Q. petiolaris* Benth.—the other parent suggested as possibly *velutina*); ×*Q. subintegra* Trelease, *l. c.*, p. 48, 1917 (*Q. falcata subintegra* Engelmann, Trans. Acad. St. Louis, vol. 3, p. 543, 1876), with *Q. rubra;* and ×*Q. oviedoensis* Sargent, Bot. Gaz., vol. 65, p. 459, 1918, with *Q. myrtifolia*.

QUERCUS IMBRICARIA Michaux.

Plate 303.

Quercus imbricaria Michaux, Hist. Chênes Amér., pl. 15–16, 1801; Michaux, f., Hist. Arb. Amér., vol. 2, pl. 13; N. A. Sylva, vol. 1, pl. 15.—Brendel, Trans. Ill. Agr. Soc., vol. 3, pl. 6.—Liebmann-Oersted, Chênes Amér. Trop., pl. D, 22.—Vasey, Amer. Entomol. & Bot., vol. 2. p. 312, f. 196.—Dippel, Handb. Laubholzk. vol. 2, p. 104, f. 46.—Wesmael, Bull. Féd. Soc. Hort. Belg., 1869, pl. 17.—Sargent, Silva, vol. 8, pl. 432; Manual, f. 204.—Gray, Manual, 7 ed., f. 689.—Britton & Shafer, N. A. Trees, f. 256.—Hough, Handbook, p. 162, ff.—Emerson & Weed, Our Trees, p. 134, pl.—Trelease, Proc. Amer. Phil. Soc., vol. 51, pl. 12.—Deam, Rep. Ind. Bd. Forestry, vol. 11, p. 208, pl. 59.—Pammel, Trans. Iowa Hort. Soc., vol. 51, after p. 96.—Otis, Mich. Trees, p. 120, f.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 63.

?*Q. aprica* Rafinesque, Alsogr. Amer., p. 26, 1838.

Q. Phellos imbricaria Spach, Hist. Vég., vol. 11, p. 160, 1842.

Atlantic region of the United States, from New York to Alabama, Missouri, Michigan, and Pennsylvania; described as from the Allegheny Mountains and westwards. Represented in Pleistocene deposits by *Q. imbricaria fossilis*.—Usually known as shingle oak, but also locally called laurel oak, jack oak, or pin oak.

A juvenile or second-growth form with somewhat spinulose-toothed foliage constitutes *Q. imbricaria spinulosa* A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 63, 1864.

This species is reported as hybridizing with *Q. marilandica* (×*Q. tridentata* Engelmann, Trans. Acad. St. Louis, vol. 3, p. 539, 1877.—*Q. nigra tridentata* A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 64.—Sargent, Silva, vol. 8, pl. 433); with *Q. palustris* (×*Q. exacta*, Trelease, Proc. Am. Philos. Soc., vol. 56, p. 49, 1917.—*Q. imbricaria*×*palustris* Engelmann, Trans. Acad. St. Louis, vol. 3, p. 539, 1877); with *Q. velutina* (×*Q. Leana* Nuttall, Silva, vol. 1, p. 13*, pl. 5 bis, 1842.—Sargent, Silva, vol. 8, pl. 434); and with *Q. maxima* (×*Q. runcinata* Engelmann in Gray, Manual, 5 ed., p. 454, 1868.—*Q. rubra runcinata* A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 60).—See also ×*Q. Egglestoni*.

QUERCUS LAURIFOLIA Michaux.

Plates 304–306.

Quercus laurifolia Michaux, Hist. Chênes Amér., pl. 17, 1801.—Liebmann-Oersted, Chênes Amér. Trop., pl. D.—Sargent, Silva, vol. 8, pl. 429–430; Manual, f. 202.—Britton & Shafer, N. A. Trees, f. 255.—Hough, Handbook, p. 160, ff.—Britton & Brown, Ill. Fl., vol. 1, p. 519; 2 ed., vol. 1, p. 621.—Trelease, Proc. Amer. Philos. Soc., vol. 51, pl. 12.—Coker, Journ. Elisha Mitch. Sci. Soc., vol. 32, p. 38, 4 pl.

Q. laurifolia acuta Willdenow, Sp. Pl., vol. 4, part 1, p. 428, 1805.

Q. laurina Rafinesque, Alsogr. Amer., p. 27, 1838.—Not *Q. laurina* Humboldt & Bonpland, 1809.

Q. Phellos laurifolia Chapman, Fl. So. St., p. 420, 1860.

Q. aquatica laurifolia A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 68, 1864.—Houba, Chênes Amér. en Belg., p. 306, pl.

Q. uliginosa laurifolia Zabel in Beissner, Schelle & Zabel, Handbuch, p. 66, 1903.

Southern Atlantic region of the United States, from southern Virginia to Florida, Mississippi, and (?) Texas. Described as from the maritime regions of South Carolina and Georgia.—The laurel-leaved oak.

It is said to hybridize with *Q. laevis* (×*Q. Mellichampi* Trelease, Proc. Amer. Philos. Soc. vol. 56, p. 50, 1917), and with *Q. cinerea* (×*Q. atlantica* Ashe, Proc. Soc. Amer. Foresters, vol. 11, p. 88, 1916.—×*Q. sublaurifolia* Trelease, *l. c.*, p. 52. 1917).

The obtuse-leaved equivalent of *laurifolia*, often with toothed leaves and of the same range as the typical form, is var. *hybrida* Michaux, Hist. Chênes Amér., pl. 18, 1801 (*Q. laurifolia obtusa* Willdenow, Sp. Pl., vol. 4, part 1, p. 428, 1805.—*Q. obtusa* Pursh, Fl. Amer., Sept., vol. 2, p. 627, 1814.—*Q. aquatica hybrida* Chapman, Fl. So. St., p. 421, 1860.—*Q. hybrida* Small, Fl. S. E. U. S., p. 350, 1329, 1903; Britton & Shafer, N. A. Trees, f. 254.—Not *Q. hybrida* Brotero, 1804, or Bechst., 1816, or Hampton, 1886). It is this which represents *Q. laurina* (by a slip of the pen for *laurifolia*?) in the herbarium of Link.

Scarcely evidently different from this except in the characteristically rhombic shape of its (less evergreen?) leaves, is var. **rhombica** (*Q. rhombica* Sargent, Bot. Gaz., vol. 65, p. 430, 1918) which ranges from Virginia through the Gulf States into eastern Texas. An oak of the latter region with subevergreen leaves otherwise indistinguishable from those of *nigra* or else larger and bluntly trilobed at apex, and fruit much as in *Q. nigra megacarpa*, is considered a forma **obovatifolia** of this (*Q. rhombica obovatifolia* Sargent, *l. c.*, p. 431, 1918). *Q. laurifolia tridentata* Sargent, *l. c.*, p. 433, 1918, differs from the type of the species in having its occasionally subsinuate leaves rather sharply 3-lobed toward the end, with acute apex and lobes. The dwarf f. **dentata** differs from this in its shorter merely toothed leaves (Oneco, Fla., *Reasoner, 403.*)

Two hybrids of *Q. rhombica* Sargent are reported: ×*Q. beaumontiana* Sargent, Bot. Gaz., vol. 65, p. 451, 1918, with *rubra;* and ×*Q. Cocksii* Sargent, *l. c.*, p. 459, 1918, with *velutina*. In foliage, the former is comparable with ×*Q. exacta* and especially with the lobed leaves of ×*Q. heterophylla*, and the latter may be compared with the more entire foliage of ×*Q. heterophylla*.

QUERCUS MYRTIFOLIA Willdenow.

Plate 303.

Quercus myrtifolia Willdenow, Sp. Pl., vol. 4, part 1, p. 424, 1805.—Sargent, Silva, vol. 8, pl. 408; Manual, f. 207.—Britton & Shafer, N. A. Trees, f. 260.—Trelease, Proc. Amer. Philos. Soc., vol. 51, pl. 12.

Q. Phellos arenaria Chapman, Fl. S. St., p. 420, 1860.

Q. aquatica myrtifolia A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 68, 1864.

Southern Atlantic region of the United States, from South Carolina to Florida; the type from the Carolinas. Though reported in a fossil state, this appears to have been by error.—The myrtle oak, or seaside scrub oak.

The type has small leaves, scarcely 3×5 cm., but in Florida the species occurs in a form with leaves much larger than this—f. **ampla.** ×*Q. oviedoensis* Sargent, Bot. Gaz., vol. 65, p. 459, 1918, is supposed to be a hybrid of *myrtifolia* with *cinerea*.

QUERCUS PHELLOS Linnaeus.

Plates 8 and 303.

Quercus Phellos Linnaeus, Sp. Pl., p. 994, 1753.—Wangenheim, Beytr. Nordamer. Holz., pl. 5.—Michaux, f., Hist. Arb. Amér., vol. 2, pl. 12; N. A. Sylva, vol. 1, pl. 14.—Torrey, Fl. N. Y., vol. 2, pl. 104.—Vasey, Amer. Entomol. & Bot., vol. 2, p. 311, f. 195 (spelled *Phillos*).—Wesmael, Bull. Féd. Soc. Hort. Belg., 1869, pl. 15, 16.—Houba, Chênes Amér. en Belg., p. 212, pl.—Dippel, Handb. Laubholzk., vol. 2, p. 106, f. 48–9.—Sargent, Silva, vol. 8, pl. 435; Manual, f. 248.—Gray, Manual, 7 ed., f. 690.—MacDougal, Bot. Gaz., vol. 43, p. 49, f. 1.—Britton & Shafer, N. A. Trees, f. 253.—Hough, Handbook, p. 158, ff.—Lewis, Trees of Texas, f. 21.—Trelease, Proc. Amer. Philos. Soc., vol. 51, pl. 12.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 63.

Q. Phellos sylvatica Michaux, Hist. Chênes Amér., pl. 12, 1801.

Atlantic region of the United States, from New York to Florida, Texas, Missouri, and Kentucky and adjacent Illinois; the type, "North America," probably from Virginia or the Carolinas. Fossil in Pleistocene deposits where it appears to be represented also by a teratological form, *Q. abnormalis*.—The willow oak.

Hybrids are reported with *Q. ilicifolia* (×*Q. Giffordi* Trelease, Proc. Am. Philos. Soc., vol. 56, p. 51, 1917); with *Q. marilandica* (×*Q. Rudkini* Britton, Bull. Torr. Bot. Cl., vol. 9, p. 13,

ff. & pl. 10–12, 1882.—Sargent, Silva, pl. 437. It is believed by Sudworth, Bull. U. S. Dep. Agric., Div. Forestry, no. 14, p. 179, that this hybrid is identical with *Q. Phellos subimbricaria* A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 63, 1864); with *Q. Pagoda* (×*Q. ludoviciana* Sargent, Trees & Shrubs, vol. 2, p. 223, 1913); and with *Q. maxima* (×*Q. heterophylla* Michaux, f., Hist. Arb. Amér., vol. 2, p. 87, pl. 16, 1912; Sylva. vol. 1, pl. 18.—Gale, Proc. Nat. Inst., 1855, p. 70, f. 1.—Liebmann-Oersted, Chênes Amér. Trop., pl. B.—Houba, Chênes Amér. en Belg., p. 224, pl.—Sargent, Silva, vol. 8, pl. 436; Manual, f. 201.—*Q. aquatica heterophylla* A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 68, 1864.—*Q. palustris heterophylla* Cockerell, Nature, vol. 66, p. 631, 1902.—×*Q. Hollickii* Schneider, Ill. Handb., vol. 1, p. 165, 1904).—A hybrid of this reputed parentage reported by Bush in Garden & Forest, vol. 8, p. 379 is ×*Q. dubia* Ashe (Journ. Elisha Mitch. Sci. Soc., vol. 11, p. 93, 1894.—Trelease, Proc. Am. Philos. Soc., vol. 56, p. 47, 49, 1917—held by its author for a probable hybrid of *Phellos* with, possibly, *Q. velutina*, though it is scarcely separable in the herbarium from entire-leaved specimens of ×*Q. Rudkini*); and ×*Q. subfalcata* Trelease, *l. c.*, p. 52, 1917 (×*Q. falcata* Ashe, *l. c.*, p. 94—not Michaux) is a hybrid of *Phellos* with *digitata* [*rubra*] according to the same writer.

PALUSTRES.[11]—Trees, sometimes large, with slender glabrous twigs, conical ovoid buds, rather moderate elliptical deeply aristate-lobed short-petioled venulose leaves glabrous except for persistent axillary tufts beneath, and biennial subsessile rather small fruit with shallow cup with thin appressed gray scales.—Atlantic region of the United States.

Lobes prevailingly long and widened upwards.
- Lobes merely toothed ..... *Q. palustris.*
- Lobes incised ..... *Q. palustris heterophylla.*

Lobes triangular, or margin merely sinuate.
- With axillary tufts of hairs beneath. Northern ..... ×*Q. exacta.*
- Without axillary domatia. Southern ..... *Q. georgiana.*

QUERCUS PALUSTRIS Muenchhausen.

Plates 1, 10, and 307.

Quercus palustris Muenchhausen, Hausvater, vol. 5, p. 253, 1770.—Du Roi, Harbk., pl. 5.—Wangenheim, Beytr. Nordamer, Holzk., pl. 5.—Michaux, Hist. Chênes Amér., pl. 33–4.—Michaux, f., Hist. Arb. Amér., vol. 2, pl. 25; N. A. Sylva, vol. 1, pl. 27.—Loudon, Arbor. Brit., vol. 3, p. 1887, pl. & f. 1758–1761.—Torrey, Fl. N. Y., vol. 2, pl. 107.—Brendel, Trans. Ill. Agr. Soc., vol. 3, pl. 10.—Oersted, Vidensk. Medel. Naturhist. Foren. Kjöbenhavn, 1866, pl. 31, 72, f. 4.—Liebmann-Oersted, Chênes Amér. Trop., pl. A.–Vasey, Amer. Entomologist & Bot., vol. 2, p. 376, f. 227.—Emerson, Trees of Mass., ed. 2, vol. 1, p. 167, pl.—Houba, Chênes Amér. en Belg., p. 169, pl.—Sargent, Silva, vol. 8, pl. 422–3; Manual, f. 187.—Gray, Manual, 7 ed., f. 681.—Britton & Shafer, N. A. Trees, f. 235–6.—Hough, Handbook, p. 142, ff.—Emerson & Weed, Our Trees, p. 126, pl.—Pammel, Trans., Iowa Hort. Soc., vol. 51. p. 96, pl.—Deam, Rep. Ind. Bd. Forestry, vol. 11, p. 195, pl. 53.—Otis, Mich. Trees, p. 110, f.—Garman, Woody Plants of Kentucky, f. 11.—Trelease, Proc. Amer. Philos. Soc., vol. 51, pl. 12.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 60.

Q. rubra dissecta Lamarck, Encycl., vol. 1, p. 720, 1783.

Q. rubra ramosissima Marshall, Arbust. Amer., p. 122, 1785.

Atlantic region of the United States, from Rhode Island to Virginia, Mississippi, Oklahoma, and Illinois; the type cultivated in Germany. Fossil in Pleistocene deposits.—The pin oak, sometimes also called water oak, water Spanish oak, or swamp Spanish oak.

A hybrid with *imbricaria* is ×*Q. exacta* Trelease, Proc. Am. Phil. Soc., vol. 56, p. 50, 1917 (*Q. palustris* × *imbricaria* Shimek, Proc. Iowa Acad., vol. 15, p. 77, pl. 1–2); and one with *maxima* is ×*Q. Richteri* Baenitz, Allgem. Bot. Zeitschr., vol. 9, p. 85, 1903). What was taken by Hill for a cross of *palustris* and *coccinea* appears to be a form of *Q. ellipsoidalis*. The occurrence of unspecified hybrids of this species at Belle Isle Park, Michigan, is reported by Alexander in Rep. Mich. Acad., vol. 6, p. 88.

[11] This corresponds to the subgenus of Limnodris of Rafinesque, Alsographia Americana, p. 26, 1838.

QUERCUS GEORGIANA Curtis.

Plate 307.

Quercus georgiana Curtis, Amer. Journ. Sci., ser. 2, vol. 7, p. 406, 1849.—Dippel, Handb. Laubholzk., vol. 2, f. 55.—Sargent, Silva, vol. 8, pl. 425.—Britton & Shafer, N. A. Trees, f. 237.—Trelease, Proc. Amer. Philos. Soc., vol. 51, pl. 12.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 60.

Local in the southern Atlantic region of the United States; the type from Stone Mountain, Georgia.—The Stone Mountain oak.

What is taken for a hybrid of this with *Q. marilandica*—"*nigra*" (×*Q. Smallii* Trelease, Proc. Amer. Philos. Soc., vol. 56, p. 51, 1917), is noted and figured by Small (Bull. Torrey Bot. Cl., vol. 22, p. 75, pl. 233).

NIGRAE.—Usually trees, sometimes large, with slender glabrous twigs, conical-ovoid typically pubescent buds, moderate or small oblong or spatulately dilated entire or variously toothed or 3-lobed venulose glabrous leaves, and biennial subsessile rather small fruit with shallow cup with thin appressed scales.—Southern Atlantic region of the United States.

Leaves conspicuously elongated.
- Subspatulate, entire or variously 3-lobed at the rather abruptly dilated apex, the margin sometimes again widened on each side toward the base.
  - Not lobed, or only shallowly round-lobed at apex.
    - Acorn small (9–13 mm. in diameter) ..... *Q. nigra.*
    - Acorn larger (12–17 mm.) ..... f. *megacarpa.*
  - Conspicuously 3-lobed ..... f. *tridentifera.*
- Lanceolate or oblong or rhombic-obovate, either entire or incised or lobed—sometimes very unsymmetrically; acorn large (15 mm.) ..... f. *hemisphaerica.*

Leaves relatively broad.
- Obovate-oblong.
  - Rather sharply 3-lobed, small ..... f. *plenocarpa.*
  - Characteristically 5-lobed.
    - Lobing unequal and sinuate ..... f. *microcarya.*
    - Lobing rather uniform and deep ..... f. *saxicola.*
- Round-obovate, entire or undulately or somewhat acutely 3-lobed at apex ..... ×*Q. arkansana.*
- Oblong-obovate, sinuate or 3- or 5-lobed ..... ×*Q. beaumontiana.*

QUERCUS NIGRA Linnaeus.

Plates 308 to 314.

Quercus nigra Linnaeus, Sp. Pl., vol. 2, p. 995, 1753.—Sargent, Silva, vol. 8, pl. 428; Manual, f. 199.—Gray, Manual, 7 ed., f. 687.—Hough, Handbook, p. 156., ff.—Lewis, Trees of Texas, f 20.—Trelease, Proc. Amer. Philos. Soc., vol. 51, pl. 12; Winter Botany, p. 29, f. 6.

Q. nigra aquatica Lamarck, Encycl., vol. 1, p. 721, 1783.

Q. uliginosa Wangenheim, Beytr. Nordam. Holzk., p. 80, pl. 6, 1787.—Dippel, Handb. Laubholzk., vol. 2, p. 109, f. 50.

Q. aquatica Walter, Fl. Carol., p. 234, 1788.—Michaux, Hist. Chênes Amér., pl. 19–21.—Michaux, f., Hist. Arb. Amér., vol. 2, pl. 17; N. A. Sylva, vol. 1, pl. 19.—Smith & Abbot, Insects of Ga., vol. 2, pl. 59.—Audubon, Birds, pl. 24.—Liebmann-Oersted, Chênes Amér. Trop., pl. D.—Vasey, Amer. Entomol. & Bot., vol. 2, p. 312, f. 197.—Britton & Shafer, N. A. Trees, f. 251.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 67.

Q. dentata Bartram, Travels, ed. 2, p. 28, 1794.—Not Thunberg, Fl. Jap., p. 177, 1784.

Q. nana Willdenow, Sp. Pl., vol. 4, part 1, p. 443, 1805.

Q. aquatica stipitata A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 68, 1864.

†*Q. novi-orleani* Petzold & Kirchner, Arbor. Muscav., p. 656, 1864.

Q. hemisphaerica nana Nuttall, Genera, vol. 2, p. 214, 1818.

Q. aquatica dentata A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 69, 1864.

Southern Atlantic region of the United States, from Delaware to Florida, Texas, Missouri, and Tennessee; the type, "North America," doubtless from the Carolinas. Fossil in Pleistocene deposits.—The water oak, duck oak, possum oak, spotted oak, or punk oak.

A marked extreme of the water oak with long-attenuate lower part of the leaf-blade and deep lobing of the apex, is var. *tridentifera* Sargent (Bot. Gaz., vol. 65, p. 429, 1918), leaves of which get into herbaria occasionally for forms of *Q. alba.*

A subevergreen form from Florida with thicker veiny leaves and larger fruit, comparable with *Q. laurifolia obovatifolia*, is var. *megacarpa* Ashe, Bull. Charleston Museum, vol. 14, p. 9, 1918.

Three upland oaks of the Stone Mountain region of Georgia and Alabama are evidently of this alliance but reduced in correlation with their localized occurrence. Though somewhat doubtfully separable from one another, and perhaps really differentiable from *Q. nigra*, they may be held for the present to be forms of that species. They are var. **microcarya** (*Q. microcarya* Small, Bull. Torrey Bot. Club, vol. 28, p. 357, 1901; *Q. microcarpa* Britton & Shafer, N. A. Trees, p. 300, f. 252, 1908; *Q. nigra tridentifera microcarya* Sargent, Bot. Gaz., vol. 65, p. 430, 1918); var. **plenocarpa** (*Q. plenocarpa* Small in herb.); and var. **saxicola** (*Q. saxicola* Small in herb.).

Quercus bumeliaefolia Riddell, New Orleans Med. & Surg. Journ., vol. 9, p. 614, 1853, appears to be a variant of the type form of this species. It was described from the alluvial lands of the Red River country, and based on Carpenter's Plants of Louisiana, no. *1556*, collected by *Hale*.

The most exasperating of eastern oaks center about *Quercus nigra*, *Q. Phellos*, and *Q. laurifolia*, each of which in its normal form is unmistakable and well characterized.

As is usual when heat and drought in the spring are followed by cool rainy weather, the buds of *Q. nigra* that have formed and terminated the season's growth may give rise to renewed growth, and this may be repeated several times in a very aberrant season. Very often the leaves on such second growths, like those of seedlings, are deeply toothed or sharply lobed throughout their length. Such seasonal heterophylly is not uncommon in species of Leucobalanus as well as in other species of Erythrobalanus. As the figures of the elder Michaux well picture, juvenile leaves of *Q. Phellos* also present this form of toothing, which in a smaller way is frequently found on older branches of *Q. cinerea*.

In the herbarium of Willdenow, which contains *Q. nigra* under the specific name *nana*, a series of entire- and toothed-leaved forms occurs as representative of *Q. hemisphaerica* as he meant to use that name—evidently given because of the spreading hemispherical head that is so marked in a fully developed tree of the water oak.

If the varying foliage were confined to sprouts and seedlings otherwise bearing representative *nigra* foliage, *Quercus hemisphaerica* would be disposed of easily as merely a heterophyllous stage of *nigra*. Unfortunately for this simple solution, large trees are found now and then on which most of the leaves are acutely toothed or lobed though some *nigra* foliage also is found on them; and other trees bear only leaves of the aberrant forms. Some cases of such heterophylly have the leaves far longer and sometimes far broader than in ordinary *nigra*, and though they may be narrowly oblong, they are entirely out of relation with *Phellos* in size and texture.

In view of these facts, though it is within the range of possibility that, as is commonly supposed to be the case, these intermediates represent hybrids between *nigra* and *Phellos*, I am disposed to consider them heterophyllous states of the former and to use varietally for them the name *hemisphaerica* under which several of them occur in Willdenow's herbarium.

Hybrids of *Q. nigra* occur with *marilandica* (×*Q. sterilis* Trelease, Proc. Am. Philos. Soc., vol. 56, p. 50, 1917); *Q. cinerea* (×*Q. caduca* Trelease, *l. c.* p. 48); and *Q. laevis* (×*Q. Walteriana* Ashe, Proc. Soc. Am. Foresters, vol. 11, p. 89, 1916—×*Q. sinuata* of most writers). *Q. hemisphaerica* has been taken, further, for a cross with *Phellos*.

The specific name *nigra* is applied to a form of the European *Q. sessiliflora* by de Morogues, Mém. Soc. Agr., etc., d'Orléans, vol. 50, p. 56, 1877.

BORUCASANAE.—Moderate-sized trees with slender glabrate twigs, ovoid buds, small broadly lanceolate glabrate short-stalked entire leaves scarcely veiny and more or less granular above, and annual rather small short-stalked fruit with thin appressed blunt tomentose scales.—Central American region.

Leaves rather short, slightly revolute.....*Q. borucasana*.

Quercus borucasana n. nom.

Plate 315.

Quercus granulata Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 186.—Liebmann-Oersted, Chênes Amér. Trop., p. 26, pl. E.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 70.—Not *Q. granulata* Rafinesque, Alsog. Amer., p. 21, 1838.

Twigs moderate (3 mm.), somewhat fluted, quickly glabrate and reddish with small pale lenticels, turning dark gray the second year. Buds brown, glabrous, ovoid, 2×3 mm. Leaves deciduous, short-lanceolate, acute, rounded or mostly very acute at base, entire, revolute, small (1.5–2.5×5–6 or 8 cm.), glabrous, nearly dull, typically granular-bullate above but smooth beneath; veins about 10×2, looped, the venulation little raised on either face; petiole glabrous, 1×2 mm. Catkins: ♂, 30 mm. long, somewhat villous, rather loosely flowered, the glabrous oblong anthers scarcely exserted. Fruit?.

Central American region.

Specimens examined.—Costa Rica. Mt. Irazu (*Oersted, 5, 3491*, the type of *Q. granulata*); Cuesta de las Borucas (*Pittier, 10553*); without data (*Endres*, in the Vienna herbarium). The granulation is lacking on both of these latter collections.

EUGENIAEFOLIAE.—Moderate-sized trees with slender from scurfy glabrescent twigs, medium-sized lanceolate rather short-petioled entire glabrate venulose leaves, and annual rather short-stalked fruit with thin appressed blunt glabrescent scales.—Central American region.

Petioles scarcely winged.
Scarcely 2 mm. long.....*Q. eugeniaefolia.*
About 5 mm. long.....*f. petiolata.*
Petioles longer, winged.....*Q. Seemanni.*

Quercus eugeniaefolia Liebmann.

Plate 316.

Quercus eugeniaefolia Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 185.—Liebmann-Oersted, Chênes Amér. Trop., p. 26.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 76.

Twigs slender (2 mm.), fluted, from floccose quickly glabrate, reddish becoming gray with small brown lenticels. Buds light brown, glabrescent, ovoid, at length 2×3 mm. Leaves deciduous, lanceolate or, when larger, oblanceolate, acute at both ends, aristate, entire or somewhat crisply undulate, scarcely revolute, rather small (2–3×7–10 or 4–5×15 cm.), glossy green and glabrous on both faces; veins about 20×2, alternately finer and evanescent, nearly horizontal, forked and looping; petiole winged, glabrous, scarcely 1×2 mm. Catkins?. Fruit biennial?, (immature) solitary and very short-stalked, the as yet round cup with thin appressed blunt scales becoming light brown and glossy where abraded.

Central American region.

Specimens examined.—Costa Rica. Without locality (*v. Warscewicz, C, C*, the type, in the Berlin herbarium); Volcan de Barba (*v. Warscewicz, 29*, 1855–6); San Lorenzo (*Pittier, 2262*, with the leaves caudately acute); Agari (*Wendland, 1265*, in part). With the winged petiole about 5 mm. long, it becomes **f. petiolata,** also from Costa Rica (*Hoffmann, 863*, July, 1857).

Quercus Seemanni Liebmann.

Plate 317.

Quercus Seemanni Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 188.—Liebmann-Oersted, Chênes Amér. Trop., p. 26, pl. 20.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 30.
Q. salicifolia Seemanni Wenzig, Jahrb. K. Bot. Gart. Berlin, vol. 3, p. 207, 1884.

Twigs rather slender (2–3 mm.), fluted, soon glabrate and rather red with small brown lenticels. Buds somewhat glossy brown, glabrous, round-ovoid, 2×3 mm. Leaves deciduous, lanceolate, acute at both ends or slightly acuminate and the apex aristate, entire, moderate (2.5–3.5 or 4×6–11 cm.), glossy and glabrous on both faces or locally a little floccose on either,

smooth or somewhat granular above; veins about 10–15 × 2, often with several evanescent intermediates, forking and obscurely looped, the venulation little raised above and less beneath; petiole glabrescent, 1 × 5 mm. Catkins: ♂, 30 mm. long, from dingy lanate glabrescent, rather closely flowered, the glabrous anthers somewhat exserted. Fruit annual, solitary or paired on a peduncle 2 × 10–15 or even 30 mm.; cup half-round or turbinate, rather small (scarcely 15 mm. in diameter), with thin appressed blunt pale-puberulent scales with brown margin: acorn ovoid, brown-pubescent, about half-included.

Central American region.

Specimens examined.—Panama. Hacienda de Boqeta, Veraguas (*Seemann, 1228*, Mar., 1848, the type, in the Hookerian herbarium at Kew, and Feb., 1849; *Bridges*, 1855); Chiriqui (*Wagner*, Apr., 1858; *Pittier, 5305*). Costa Rica. Agari (*Wendland, 1265*, in part); Cuesta de Tarrazu (*Tonduz, 7871*).

ACATENANGENSES.—Moderate-sized trees with rather slender glabrate twigs, rather small lanceolate entire or slightly aristately toothed rather short-petioled acute glabrate venulose leaves, and biennial moderate-sized thick-stalked fruit with appressed somewhat pointed rather glabrescent somewhat keeled scales.—Central American region.

Leaves typically broad and little attenuate above; petiole well developed.....*Q. Donnell-Smithii.*
Leaves typically long and narrow, and setaceously very acute.
Subsessile.....*Q. flagellifera.*
Very distinctly petioled.....*Q. acatenangensis.*

Quercus Donnell-Smithii n. sp.

Plate 318.

Twigs slender (scarcely 2 mm.), fluted, from stellate-canescent glabrate, red with scarcely evident lenticels or finally gray. Buds glossy red-brown, glabrous, rounded and 2 mm. in diameter, or the terminal prismatic-ovoid and 2 × 4 mm. Leaves deciduous after flowering, narrowly to broadly lanceolate, acute at each end or acuminate-attenuate, entire or with an exceptional very low tooth, slightly crisped and minutely subrevolute, rather small (1.5–3 or 3.5 × 6–7 or 9 cm.), glossy and glabrous on both faces, or the midrib slightly scurfy above, and with axillary tufts beneath; veins about 8–10 × 2, fine, looped toward the margin; petiole finely stellate or glabrate, 1 × 5–10 mm. Catkins: ♂, 40 mm. long, somewhat fleecy, rather loosely flowered, the oblong glabrous anthers little exserted. Fruit biennial, solitary, or paired on peduncles 3 × 3–5 mm.; cup shallow, cup-shaped, rather large (15–20 mm. in diameter), with thick-based appressed acuminate brown scales golden-puberulent in sheltered places; acorn ovoid, 20 mm. long, typically about one-third included.

Central American region.

Specimens examined.—Guatemala. Volcan Sta. Maria (*Nelson, 3720*); Quiché to Totonicapan (*Cook, 28*); Sapote (*Smith, 1967*, the type); without locality (*Hartweg, 619*); Quezaltenango (*Trelease, 54*).

Quercus flagellifera n. sp.

Plate 319.

Twigs slender (2 mm.), fluted, from scurfy, glabrate, somewhat glossy red with little-evident lenticels. Buds light brown, glabrous and glossy, small, for a time with linear papery stipules about 10 mm. long. Leaves deciduous?, oblanceolate, long-acute, cuneate or the narrowed base mostly abruptly rounded, entire or with a few low and small deltoid serratures bearing very slender usually ascending awns, finely crisped and minutely revolute, rather small (2–2.5 × 10–16 cm.), glossy and glabrous on both faces; veins 20 × 2 or more, nearly horizontal, looped, the fine venulation little evident beneath but sharply raised above; petiole somewhat woolly or glabrescent, scarcely 1 × 2 mm. Flowers and fruit?.

Central American region.

Specimens examined.—Guatemala. Finca Sepacuite, Alta Verapaz (*Cook & Griggs, 607*, Apr. 14, 1902, the type, in the U. S. National herbarium).

Quercus acatenangensis n. nom.

Plate 320.

Quercus longifolia Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 185.—Liebman-Oersted, Chênes Amér. Trop., p. 26.—Not *Q. longifolia* Rafinesque, Alsographia Amer., p. 21, 1838.
Q. acutifolia longifolia A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 67, 1864.
Q. xalapensis longifolia Wenzig, Jahrb. K. Bot. Gart. Berlin, vol. 3, p. 210, 1884.

Twigs slender (2 mm.), fluted, glabrous, dark red, with small pale lenticels. Buds glossy light brown, glabrous, ovoid, 2 ×3 mm. Leaves scarcely evergreen, elongated lanceolate, acute at both ends, entire, low mucronate-dentate, or with irregularly placed deltoid teeth, moderate (2 ×10 to 3 ×9 or 5 ×15 cm.), glossy and glabrous on both faces; veins about 10–12 ×2, often with evanescent intermediates, branching and looped; petiole glabrous, 1 ×10 mm. Catkins?. Fruit biennial, solitary, or several on a peduncle 3–4 ×10–20 mm.; cup turbinate, moderate (scarcely 15 mm. in diameter), with thin somewhat loose acute canescent scales; acorn ovoid, half-included.

Central American region.

Specimens examined.—Guatemala. Without locality (v. *Warscewicz, 47, 48,* the types, in the Berlin herbarium, *46*); Volcan Acatenango (*Kellerman, 4826, 4828, 5151,* with quickly glabrous staminate catkins with elliptical exserted glabrous anthers).

CAERULEOCARPAE.—Moderately large trees with rather slender scurfy or tomentose twigs, ovoid buds, medium-sized lanceolate entire moderately long-petioled glabrescent leaves finely raised-reticulate on both faces, and annual moderate-sized roundish short-stalked fruit with appressed blunt canescent small scales.—Cordilleran and eastern Sierra Madre regions.

Leaves subacute at base.....*Q. caeruleocarpa.*
Leaves round-based, long-acute.....*Q. Ghiesbreghtii.*

Quercus caeruleocarpa n. sp.

Plate 321.

Twigs rather slender (2–3 mm.), little fluted, glabrate from dingy stellulate scurfy. Buds glossy brown, glabrate, ovoid, 2 mm. in diameter. Leaves subevergreen?, lanceolate, acute at both ends or somewhat rounded at base, entire, very minutely revolute, moderate (3–3.5 × 8–10 cm.), green and glossy on both faces, glabrous except for the slightly puberulent midrib above and some axillary tufts beneath; veins about 8–10 × 2, looped at some distance from the margin; petiole scurfy, about 1 × 10 mm. Catkins?. Fruit annual, on a stalk scarcely 10 mm. long; cup deeply saucer-shaped, moderate (15 mm. in diameter), with thin appressed very obtuse somewhat tomentose brown scales; acorn ovoid, umbilicate, glabrous and lightly glaucous, half-included.

Cordilleran region of Mexico.—A small tree 5–6 m. high.

Specimens examined.—Federal District. Contreras, at 2,500 m. (*Endlich, 1365a,* Sept. 9, 1906, the type).

QUERCUS GHIESBREGHTII Martens and Galeotti.

Plates 321 and 322.

Quercus Ghiesbreghtii Martens & Galeotti, Bull. Acad. Brux., vol. 10, part 1, p. 212, 1843.—Liebmann-Oersted, Chênes Amér. Trop., pl. D, 21.—v. Ettingshausen, Denkschr. K. Akad. Wien, vol. 15, part 1, pl. 9.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 30.

Twigs moderate (3 mm.), little fluted, at first densely dingy-tomentose. Buds rather glossy brown, glabrate, ovoid, 2–3 × 4 mm. Leaves evergreen, lanceolate, long-acute, very round at base, entire, slightly revolute, moderate (3–3.5 × 8–10 cm.), green and somewhat glossy on both faces but more or less persistently dingy-tomentose on the principal veins beneath; veins about 12 × 2, obscurely looped, the venulation rather sharp above; petiole at first tomentose, 2 × 15–20 mm. Catkins: ♂, 40 mm. long, glabrescent, rather closely flowered, the oblong glabrous anthers little exserted; ♀, about 5 mm. long, usually 2-flowered at top. Fruit annual, on a tomentose stalk usually 2 × 15–20 mm.; cup turbinate-saucer-shaped, rather small (12 mm. in diameter), with thin appressed blunt gray scales, brown at the margin by abrasion; acorn short-ovoid, about 12 mm. long, from scurfy becoming somewhat glossy, less than half-included.

Eastern Sierra Madre region of Mexico.—A tree 12–20 m. high.

Specimens examined.—Mt. Orizaba, at 3,300 m. (*Galeotti, 128*, 1840, the type); Orizaba (*Botteri, 1032*); Totutla (*Liebmann, 3482*, Aug., 1841); without locality (*Ghiesbreght, 13*, 1842).

ZEMPOALTEPECANAE.—Moderately large trees with rather slender scurfy twigs, acute ovoid buds, medium-sized lanceolate entire or falcately few-toothed thick glabrescent leaves raised-venulose on both faces, and annual ?, moderate-sized roundish short-stalked fruit with appressed blunt somewhat hairy coarse scales.—Cordilleran region of Mexico.

Leaves rather abruptly wing-petioled.....*Q. zempoaltepecana.*

Quercus zempoaltepecana n. sp.

Plate 323.

Twigs rather slender (2–3 mm.), somewhat fluted, soon glabrous, dull blackish red with small pale lenticels. Buds dull brown, glabrous, ovoid, 2–3×4 mm. Leaves deciduous ?, more or less ovately elliptical, very obtuse to acute, obliquely rounded to subacute at base, undulate or entire to distantly toothed, at least toward the apex, the broadly triangular sharply setaceous teeth often falcately recurved, minutely cartilaginous-revolute, moderate (2×5–6, on young shoots, to mostly 3–4×7–9 cm.), slightly glossy and glabrous above, rather paler, dull and occasionally with axillary tufts beneath; veins about 6–8×2, irregularly and unequally looped, finely raised-reticulate on both faces; petiole glabrous, winged, about 1.5×10 mm. Catkins ?. Fruit annual, mostly solitary and sessile or the peduncle scarcely 5 mm. long; cup turbinate, rather small (12–15 mm. in diameter), with thin appressed blunt brown-puberulent scales; acorn ovoid, fully half-included.

Cordilleran region of Mexico.

Specimens examined.—Northwest slope of Mt. Zempoaltepec, Oaxaca, at 2,600–3,300 m. (*Nelson, 672*, July 10, 1894, the type in the U. S. National herbarium); Cerro de S. Felipe, Oaxaca, at 3,000 m. (*C. L. Smith, 778*, Nov. 3, 1894).

LANCEOLATAE.—Rather small trees with slender more or less glabrate twigs, ovoid buds, moderate or small generally lanceolate moderately long-petioled entire or aristately low- or few-toothed usually glabrescent rather thin leaves more or less raised-veiny on both faces, and either annual or biennial rather small usually short-stalked fruit with appressed canescent or glabrate scales.—Mexican table-land and adjacent cordillera or sierras.

Leaves golden-tomentulose beneath.....*Q. cuajimalpana.*
Leaves not tomentulose.
  Leaves relatively broad, entire or coarsely few-toothed.
    Usually broadest below the middle.
      Fruit annual: scales pubescent, thin.
        Cup half-round.....*Q. tlapuxahuensis.*
        Cup turbinate.....v. *obconica.*
      Fruit biennial: scales glabrous and glossy, thickened below.....*Q. lanceolata.*
    Characteristically broadest above the middle.
      Scales glabrate and glossy.....*Q. laurina.*
      Scales pubescent.
        Petiole elongated (over 10 mm.), glabrous.....*Q. major.*
        Petiole short (under 10 mm.), fleecy.....*Q. barbinervis.*
  Leaves relatively narrow, entire or aristate-serrate, except in the last.
    Petiole moderate (about 10 mm.), glabrous.
      Northern; leaves mostly aristate-serrate, lance-oblong.....*Q. affinis.*
      Southern; leaves mostly entire.
        Fruit short-stalked.....*Q. ocoteaefolia.*
        Fruit long-stalked.....f. *podocarpa.*
    Petiole short (scarcely 5 mm.).
      Leaves mostly aristate-serrate.
        Lanceolate, round-based.....f. *confusa.*
        Oblanceolate, subcuneate.....*Q. affinis commutata.*
      Leaves mostly entire, broadly lanceolate.
        Fruit biennial.....f. *subintegra.*
        Fruit annual.....*Q. Bourgaei.*
      Leaves often coarsely few-toothed.....v. *ilicifolia.*

Quercus cuajimalpana n. sp.

Plate 324.

Twigs slender (2 mm.), fluted, from scurfy-stellate quickly glabrescent and rather glossy reddish with small but prominent round lenticels. Buds rather dull brown, somewhat hairy, round-ovoid, about 2 mm. in diameter. Leaves deciduous, lanceolate, aristately acute, rounded at base, rather small (2–2.5×6–9 cm.), entire, very minutely revolute, glossy, cancellately venulose, essentially glabrous above, densely golden-tomentulose beneath; veins about 12×2, with fainter intermediates, forking and looped; petiole stellate-tomentulose, scarcely 10 mm. long. Catkins: ♀, about 5 mm. long, 1- or 2-flowered. Fruit biennial, the young cups with appressed broad rounded very obtuse scales tomentose except on the brown margins.

Cordilleran region of Mexico.

Specimens examined.—Cuajimalpa, Federal District (*Arsène, 8866*, the type, as sheet *1000737* in the U. S. National herbarium).

Quercus tlapuxahuensis A. de Candolle.

Plate 325.

Quercus tlapuxahuensis A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 29, 1864.
Q. salicifolia tlapuxahuensis Wenzig, Jahrb. K. Bot. Gart. Berlin, vol. 3, p. 207, 1884.

Twigs moderate (3 mm.), somewhat fluted, glabrous, dull blackish or gray with prominent small lenticels. Buds dull brown, loosely hairy above, ovoid, 2×3–4 mm. Leaves deciduous?, lanceolate, rather aristately acute, rounded at base, moderate (2.5–3.5×7–9 or 10 cm.), entire, very minutely revolute, glossy, glabrous except for axillary tufts beneath, or the midrib slightly puberulent above; veins about 12×2, with fainter intermediates, forking and looped; petiole puberulent above, 1×10–20 mm. Catkins?. Fruit annual, subsessile or on a peduncle scarcely 3×10 mm., occasionally appearing to be biennial, perhaps from a renewed growth of the end of the shoot; cup half-round, moderate (15 mm. in diameter), with appressed obtuse finely tomentose or by abrasion glossy brown scales somewhat revolutely thickened in part; acorn short-ovoid, 15 mm. long, fully half-included.

Western Sierra Madre region of Mexico.

Specimens examined.—Tlalpuxahua, Michoacan (*Hartweg, 430*, the type); without locality (*?Graham, 336*, 1830); Cerro Azul, Morelia, Michoacan (*?Arsène*, 1911), with scurfy twigs. Specimens with the foliage of this species but with turbinate cups, occurring under Bourgeau's number *1013*—which is properly the type of *Q. Bourgaei*—from the valley of Mexico, may be known as var. **obconica.**

Quercus lanceolata Humboldt and Bonpland.

Plate 326.

Quercus lanceolata Humboldt & Bonpland, Plant. Aequinoct., vol. 2, p. 34, pl. 81, 1809.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 69.

Twigs slender (2 mm.), somewhat fluted, transiently stellate-scurfy. Buds rather dull brown, for a time hairy, ovoid, 2×3 mm. Leaves evergreen?, lanceolate, acute at both ends or somewhat rounded at base, entire or exceptionally with a few low aristate teeth, rather small (2.5–3.5×7–10 cm.), rather glossy, glabrous or slightly scurfy above or floccose in the axils beneath; veins about 8×2, rather evidently looped at some distance from the margin, the venulation rather prominent on both faces; petiole glabrescent, 1×10–20 mm. Catkins?. Fruit biennial, solitary or paired on a peduncle 2×5–10 mm.; cup half-round, rather small (12 mm. in diameter), with appressed blunt glabrous and rather glossy brown scales, the lower of which are thickened toward the base; acorn ovoid, scarcely half-included.

Mexican table-land.—A tree 10–15 m. high.

Specimens examined.—Moran to Sta. Rosa (*Bonpland*, the type).

QUERCUS LAURINA Humboldt and Bonpland.

Plates 327 to 329.

Quercus laurina Humboldt & Bonpland, Plant. Aequinoct., vol. 2, p. 32, pl. 80, 1809.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 58.

Twigs rather slender (2–3 mm.), somewhat fluted, from stellate-scurfy becoming glabrous and dark red or blackish with small pale lenticels. Buds rather dull brown, glabrescent, ovoid, 2×3 mm. Leaves deciduous, broadly lanceolate or oblanceolate, acute or subacuminate, typically rounded at base, entire or exceptionally with one or two aristate teeth on each side, somewhat concave and slightly revolute, rather small (2.5–3×7–10 cm.), glossy, glabrous or slightly puberulent on the midrib above and floccose in the axils beneath; veins about 10×2, obscurely looped, the venulation prominent on both faces; petiole puberulent, 1×10 mm. Catkins: ♀, 5–15 mm. long, about 3-flowered. Fruit annual?, solitary or paired on a peduncle 2–3×5–15 mm.; cup half-round, moderate (12–15 mm. in diameter), with appressed blunt glabrous and rather glossy brown scales, the lower of which are more or less thickened toward the base; acorn ovoid, about half-included.

Mexican table-land.—A tree 10–25 m. high.

Specimens examined.—Cerro de las Navajas, near Moran (*Bonpland, 4143*, the type); vicinity of Real del Monte (*Ehrenberg, M, O, 1006*, with some cups 20 mm. in diameter, *1007, 1026, 1027; Streator,* 1891); without locality (*Uhde, 267, 279, 300*).

There seems to be no point at which the line can be drawn between the typically broader oblanceolate leaf-form of this species and the typically narrower lanceolate form of *Q. lanceolata;* and the bulging thickening of the scales, to which the authors of the two species attached importance, does not appear dependable. It is certain that at least some of the specimens most representative of *lanceolata* have a new growth beyond that on which their fruit is borne; this is equally true of the type of *laurina* at Paris, while the equivalent specimen at Berlin does not show this character, leaving the delimitation of the two species still uncertain.

Quercus major n. comb.

Plate 330.

Quercus nitens major A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 69, 1864.—Liebmann-Oersted, Chênes Amér. Trop., pl. 11, pl. C ?.

Q. laurina major Wenzig, Jahrb. K. Bot. Gart. Berlin, vol. 3, p. 205, 1084.

Twigs rather slender (2–3 mm.), fluted, glabrate with prominent small pale lenticels. Buds glabrescent, acute, ovoid, 2×3 mm. Leaves deciduous, lanceolate to oblanceolate-obovate, acute at both ends or rounded at base, shouldered or few-toothed above to rather deeply serrate-incised with aristate teeth, rather small to moderate (2–2.5 or 4×6–8 or 9 cm.), rather glossy, glabrous or somewhat scurfy or puberulent along the midrib above and somewhat fleecy in the axils beneath; veins about 10×2, more or less looped at some distance from the margin, the venulation somewhat prominent on both faces; petiole glabrous, 1×10–20 mm. Catkins?. Fruit biennial, solitary or paired on a peduncle about 3×5 mm.; cup half-round, moderate (15 mm. in diameter), with appressed blunt thin puberulent scales; acorn ovoid, half-included.

Eastern Sierra Madre region of Mexico.

Specimens examined.—Alpatlahua (*Liebmann,* Sept. [1841?], the type of *Q. nitens major* in the Candollean herbarium, etc.); Orizaba (?*Lemmon, 106*).

A species comparable in foliage with *Q. laurina* and *Q. barbinervis,* varying into almost as deep toothing as in the *Grahami-xalapensis* group.

QUERCUS BARBINERVIS Bentham.

Plate 331.

Quercus barbinervis Bentham, Plant. Hartweg., p. 56, 1840.—v. Ettingshausen, Denkschr. K. Akad. Wien, vol. 15, part 1, pl. 10.—Liebmann-Oersted, Chênes Amér. Trop., pl. E, 18.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 31.

Q. laurina barbinervis Wenzig, Jahrb. K. Bot. Gart. Berlin, vol. 3, p. 205, 1884.

Twigs rather slender (2–3 mm.), somewhat fluted, rather sparsely tomentose. Buds dull, glabrescent, ovoid, 2×3 mm. Leaves deciduous, subelliptical-obovate, acute, mostly rounded at base, coarsely few-toothed above, slightly revolute, moderate or rather small (2–2.5×4–5 or, on shoots, 4–5.5×9–13 cm.), rather glossy, glabrate or somewhat fleecy, especially in the axils, beneath; veins about 8×2, rather obscurely looped, the veinlets prominent on both faces; petiole fleecy, 1×5–8 mm. Catkins ?. Fruit (always ?) annual, solitary or paired on a short stalk; cup half-round, moderate (12–15 mm. in diameter), with thin appressed blunt glabrescent scales; acorn ovoid, about half-included. The fruit appears to be biennial in some specimens of *Ehrenberg, 1008*, and in *Dugès, 6*.

Mexican table-land.

Specimens examined.—Real del Monte (*Hartweg, 427*, the type; *Ehrenberg, R1, 264, 1008*); without locality (*Graham, 335, 337; Deppe, C; Uhde, 278, 280–286*). Sta. Rosa (*?Dugès, 6, 7*).

QUERCUS AFFINIS Scheidweiler.

Plates 332 and 333.

Quercus affinis Scheidweiler, Hort. Belg., vol. 4, p. 321, pl. 17, 1837.—Not *Q. affinis* Martens & Galeotti.

Q. nitens Martens & Galeotti, Bull. Acad. Brux., vol. 10, part 1, p. 217. 1843.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 68.

Twigs slender (2 mm.), somewhat fluted, reddish-brown with small pale lenticels, at first scurfy. Buds glossy brown, glabrous, round-ovoid, 2 mm. in diameter. Leaves evergreen, oblong-lanceolate, acute at both ends, setaceously sharply serrate, rather thin and flat, small (1.5–2×4.5 to mostly 7 or 9 cm.), glossy, glabrous; veins about 10–12×2, looped, the veinlets scarcely raised; petiole glabrous, 1×5–10 mm. Catkins: ♀ about 10 mm. long, 1- or 2-flowered at top. Fruit (always ?) biennial, short-stalked; cup (immature) with thin rather acute appressed ciliate brown scales; acorn ?.

Mexican table-land.—A tree 15 to 30 m. high.

Specimens examined.—Moran (*Galeotti, 115*—the type of *Q. nitens* M. & G.—which was distributed in part under Scheidweiler's name, as is shown by the specimen in the Hookerian herbarium at Kew; *Dugès*, 1902.)

The figure given by Scheidweiler, who based his species on material collected by Galeotti between Regla and Istula, some 5 leagues from Real del Monte, viewed in connection with all of the oaks that are known to have been collected by Galeotti, so fully confirms the identity of this with the *nitens* of Martens and Galeotti, who placed them together with a question, as to necessitate taking up the earlier-published name, though it also displaces the other name as used by the same authors.

With more persistently scurfy twigs, midrib and petiole, the latter scarcely 5 mm. long, and more prominent very fine reticulation on the upper surface of the oblanceolate more or less toothed (1–2×4–6.5 cm.) leaves, it is f. **commutata:** Jalacingo (*Schiede, 18*, taken as the type of *Q. commutata* Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 177); Totonillo (*Berlandier, 410*); Pico de Orizaba (*?Liebmann, 50*, Sept. 1841); Boca del Monte (*?Schenck*, 93). Liebmann introduced the name *commutata* merely as a means of reforming the confused synonymy of *nitens*, and his replacement name included the typical form of this as well as the form to which it is here restricted. With more broadly lanceolate, longer-attenuate, commonly entire leaves it is f. **subintegra:** Zacualtipan (*Hartweg, 422*, the type of *Q. nitens subintegra* A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 69, 1864.)

QUERCUS OCOTEAEFOLIA Liebmann.

Plates 334 and 335.

Quercus ocoteaefolia Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 176.—Liebmann-Oersted, Chênes Amér. Trop., p. 23.

Q. nitens ocoteaefolia A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 69, 1864.—Liebmann-Oersted, Chênes Amér. Trop., pl. 9, 1869.

Q. laurina ocoteaefolia Wenzig, Jahrb. K. Bot. Gart. Berlin, vol. 3, p. 205, 1884.

Q. ocotaefolia, Liebmann-Oersted, Chênes Amér. Trop., pl. E, 1869.

Twigs slender (2 mm.), fluted, from scurfy glabrescent and reddish or blackish gray with small pale lenticels. Buds glossy brown, glabrescent, ovoid, 1.5×3 mm. Leaves deciduous, lanceolate, acute at both ends or rather rounded at base, entire or exceptionally with several prominent serratures, somewhat crisped, moderate (2.5–3×8–10 cm.), glossy and glabrous on both faces or somewhat tufted in the axils beneath; veins about 8–10×2, looped, the venulation somewhat prominent on both faces; petiole rather scurfy, 1×10–15 mm. Catkins ?. Fruit biennial, solitary or paired on peduncles some 2×10 mm.; cup half round, small (10 mm. in diameter), with thin appressed obtuse brown or somewhat golden- or gray-puberulent scales; acorn ovoid, somewhat hairy, half-included.

Southern cordilleran region of Mexico.—A small tree.

Specimens examined.—Oaxaca. Talea, Laguna, at 1,300–1,600 m. (*Liebmann, 122–3, 3520*, the type); El Pelado, Serrania de Oaxaca (*Liebmann, 55, 3521*); Sierra de S. Felipe (*?Pringle, 4913*); Oaxaca (*?Galeotti, 106*). Pueblo. Honey Station (*?Pringle, 13295*); Totimehuacan (*Arsène, 1050*); also in Michoacan?; Mt. Tancitaro (*Nelson, 6902*) and Sierra de S. Andres (*Ross, 378*).

With the fruiting peduncle lengthened to 25 mm., and somewhat thickened lower cup-scales, it is f. **podocarpa:** Chinantla, Puebla (*Liebmann, 3441*, the type of *Q. nitens podocarpa* A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 69, 1864.—Liebmann-Oersted, Chênes Amér. Trop., pl. 10.—*Q. laurina podocarpa* Wenzig, Jahrb. K. Bot. Gart. Berlin, vol. 3, p. 205, 1884). With shorter entire or sparingly bristly-serrate leaves from ovate to lanceolate or oblanceolate, 2–2.5×4–7 cm., on scurfy petioles scarcely 5 mm. long, and fruiting peduncles scarcely longer, it becomes f. **confusa:** Chinantla (*Liebmann, 60–64*); Cumbre de Istepec (*Liebmann, 65, 3519*); Cuesta de Lachopa (*Liebmann, 3515*); Cerro Leon (*Liebmann, 3515*); Semoaltepec (*Liebmann, 80, 82, 3517*); El Pelado, Serrania de Oaxaca (*Liebmann, 45–7, 3495, 54, 3513, 73, 75, 76, 3472*), from which place comes the type of *Q. lanceolata undulato-dentata* A de Candolle, *l. c.*, p. 70, 1864.

Quercus Bourgaei Oersted n. sp.

Plate 336.

Quercus Bourgaei Oersted in Hemsley, Biol. Centr.-Amer., Botany, vol. 3, p. 168, 1883.—Name only.

Twigs slender (2 mm.), little fluted, more or less persistently gray-tomentose or scurfy, becoming brown or dark gray. Buds glossy brown, glabrescent, ovoid, scarcely 2 mm. long. Leaves deciduous, short-lanceolate, aristately acute, mostly rounded at base, entire or with several aristate low teeth, small (1–2×3–5 cm.), glossy and glabrous above, dull beneath and slightly floccose in the axils; veins about 8×2, conspicuously looped below the margin, the veinlets little raised beneath; petiole hoary, 1×5-8 mm. Catkins ?. Fruit (always?) annual, subsessile or on a stalk scarcely 3×10 mm.; cup somewhat turbinate, shallow, moderate (15-20 mm. in diameter), with somewhat thick-based appressed rather acute hoary scales; acorn ovoid, lightly glaucous, less than one-third included.

Northern cordilleran region of Mexico.—A tall pyramidal tree.

Specimens examined.—San Nicolas, valley of Mexico (*Bourgeau, 1013*, the type); Contreras (*Pringle, 10315*, with larger longer-petioled leaves 2-3×5-11 cm., recalling those of *Q. barbinervis*, and fruit sometimes appearing to be biennial, var, **ilicifolia**, to which, also, *?Endlich, 644, 1365b*, a small tree only 5-6 m. high).

DEPRESSAE.—Shrubs with slender puberulous twigs, ovoid buds, rather small broadly lanceolate short-petioled entire or few-toothed glabrescent thick scarcely venulose leaves, and biennial rather small short-stalked fruit with appressed somewhat pointed glabrescent scales.—Mexican table-land and cordillera.

Leaves acute, mostly toothed; cup-scales rather coarse.....*Q. depressa.*
Leaves obtuse, mostly entire; cup-scales fine.....*Q. subavenia.*

QUERCUS DEPRESSA Humboldt and Bonpland.

Plates 337 and 338.

Quercus depressa Humboldt & Bonpland, Plant. Aequinoct., vol. 2, p. 50, pl. 92, 1809.—Liebmann-Oersted, Chênes Amér. Trop., pl. 15.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 70.

Twigs slender (2 mm.), somewhat fluted, rather persistently stellate-scurfy, becoming gray. Buds dull brown, nearly glabrous, ovoid, 2×2-3 mm. Leaves evergreen, rather thick, subelliptical, acute or acuminate, rounded at base, entire or mostly few-toothed, slightly revolute, small (1-2×2.5-4 cm.), rather glossy, glabrate or with somewhat puberulent midrib above; veins about 6×2, indistinctly looped, the veinlets little raised; petiole puberulent or glabrate, 1×4 mm. Catkins: ♂, 30 mm. long, scurfy, rather loosely flowered, the ellipsoid glabrous anthers little exserted. Fruit biennial, solitary or paired on a peduncle scarcely 5 mm. long; cup half-round, small (10 mm. in diameter), with thin appressed blunt somewhat hoary scales; acorn acutely ovoid, about half-included.

Mexican table-land.—A low shrub.

Specimens examined.—El Jacal, Moran (*Bonpland*, the type); vicinity of Real del Monte (*Ehrenberg, Q, 924*); Cerro de las Navajas in the same region (*Ehrenberg*); Mt. Orizaba (*?Galeotti, 113*); without locality (*Galeotti, 5*, from which the fruit is described).

Quercus subavenia n. sp.

Plate 338.

Twigs slender (2 mm.), somewhat fluted, rather persistently stellate-scurfy, from blackish becoming gray. Buds dingy brown, glabrous, round-ovoid, 2×3 mm. Leaves subevergreen, shortly lance-elliptical, mucronately acute, rather rounded at base, entire or exceptionally shallowly few-toothed above, small (1.5–2.5×4–4.5 cm.), slightly glossy, glabrous, or somewhat minutely stellate on the upper face; veins about 10×2, looped, the venulation little evident; petiole glabrescent, 2×5 mm. Catkins: ♂, 50 mm. long, scurfy, rather closely flowered, the glabrous ellipsoid anthers little exserted; ♀, scarcely 5 mm. long, with 1 or 2 flowers at the end. Fruit biennial, single or paired on a short stalk; cup somewhat turbinately saucer-shaped, moderate (15 mm. in diameter), with appressed blunt glabrous and glossy light brown scales, the lower somewhat keeled; acorn ovoid, minutely silvery-scurfy, one-third included.

Cordilleran region of Mexico.—A shrub less than 1 m. high.

Specimens examined.—Honey Station, Puebla (*Pringle, 8908*, the type).

SIDEROXYLAE.—Small trees with slender glabrate twigs, ovoid buds, rather small petioled elliptical-obovate firm glossy pungently toothed leaves slightly venulose above and more or less stellate beneath, and biennial small fruit with thin appressed glabrescent scales.—Mexican table-land.

Leaves coarsely serrate, cordate.
Broadest above the middle.....*Q. sideroxyla.*
Elliptical.....f. *aquifolia.*
Leaves low aristate-serrate.....f. *ciliifera.*

QUERCUS SIDEROXYLA Humboldt and Bonpland.

Plate 339.

Quercus sideroxyla Humboldt & Bonpland, Plant. Aequinoct., vol. 2, p. 39, pl. 85, 1809.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 58.

Twigs slender (2 mm.), somewhat fluted, stellate-lanose. Buds rather glossy brown, glabrescent, ovoid, 2×3 mm. Leaves evergreen, broadly oblong, rather acute, cordate, rather

sharply and deeply dentate-serrate, small (2–2.5×4–6.5 cm.), glabrous and very glossy above, less polished and stellate-tufted or glabrescent beneath; veins about 6–7×2 branched but scarcely looping; petiole hairy, 1×5 mm., pinkish. Catkins?. Fruit biennial; cup deep, moderate (12 mm. in diameter), with thin appressed blunt glabrescent brown scales; acorn half-included.

Mexican table-land.—A large tree.

Specimens examined.—Sta. Rosa (*Bonpland*, the type).

With broadly elliptical deeply cordate hollylike leaves 3×4 cm., it is f. **aquifolia**: Sta. Rosa (*Dugès, 4*, in the Gray herbarium). With smaller (1.5×4 cm.) elliptical-ovate less deeply toothed leaves rather longer-petioled, it is f. **ciliifera**: Regla, near Real del Monte (*Ehrenberg, 1279*); Sta. Rosa (*Dugès, 5, vi*).

HYPOXANTHAE.—Small trees with rather slender often persistently hoary twigs, ovoid buds, and small short-stalked elliptical firm glossy pungently toothed leaves very slightly venulose above and denudably scurfy-tomentose beneath.—Northern Sierra Madre region of Mexico.

Leaves yellow-scurfy beneath.....*Q. hypoxantha.*

Quercus hypoxantha n. sp.

Plate 339.

Twigs rather slender (2–3 mm.), fluted, either glabrescent and brownish gray or persistently hoary in the second or even the third year. Buds glossy brown, puberulent, ovoid, 2 mm. in diameter. Leaves evergreen, ovate-elliptical, aristately acute, shallow-cordate, pungently aristate-serrate, crisped and revolute, small (2×4 cm.), glabrous and glossy above, denudably yellow scurfy-tomentulose beneath; veins about 6×2, branched but scarcely looping, the very minute venulation little raised; petiole tomentose, about 1×5 mm. Catkins: ♂, at first cobwebby, the young flowers red-purple; ♀, 5–10 mm. long, 1- or 2-flowered at end of the glabrous glossy red peduncle, the glabrescent young cup-scales very blunt and the styles elongated. Fruit?.

Eastern Sierra Madre region of Mexico.—A small tree.

Specimens examined.—Mountains near Saltillo, Coahuila, at 2,300 m. (*Pringle, 10227*, Apr. 12, 1906, the type, in the Gray herbarium).

TRIDENTES.—Small to rather large trees with slender glabrescent twigs, ovoid buds, rather small oblong or lanceolate petioled little-veiny thin leaves entire or aristately toothed toward the end and subglabrous beneath, and biennial? fruit in somewhat stalked clusters.—Mexican table-land.

Leaves broadest and incised-toothed upwards.....*Q. chrysophylla.*
Leaves typically broadest at base, mostly entire.....*Q. tridens.*

QUERCUS CHRYSOPHYLLA Humboldt and Bonpland.

Plate 340.

Quercus chrysophylla Humboldt & Bonpland, Plant. Aequinoct., vol. 2, p. 42, pl. 87, 1809.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 75.

Twigs slender (2 mm.), little fluted, from yellow stellate-tomentose glabrescent, rather reddish, somewhat glossy, with small pale lenticels. Buds reddish, glabrous, ovoid, 1×2 mm. Leaves deciduous, elliptical or obovate-oblong with nearly straight sides, subacute, rounded at base, setaceously several-toothed above, small (2–2.5×4–6.5 cm.), glabrescent and somewhat glossy above, densely short rusty- or golden?-tomentose beneath until end of the flowering season; veins about 6–8×2, scarcely looped, the reticulation prominent on the upper face; petiole tomentose, 1×5–10 mm. Catkins: ♂, 40 mm. long, rather closely flowered; ♀, under 10 mm. long, 1- to 3-flowered at end. Fruit?.

Mexican table-land.—A tree 16 m. high.

Specimens examined.—Moran to Pachuca, at 2,800 m. (*Bonpland, 4062*, the type).

In leaf-shape very like *Q. deserticola*, and apparently with short styles suggesting a white oak, but with the aristate toothing of Erythrobalanus.

QUERCUS TRIDENS Humboldt and Bonpland.

Plate 340.

Quercus tridens Humboldt and Bonpland, Plant. Aequinoct., vol. 2, p. 56, pl. 96, 1809.
Q. castanea tridens A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 72, 1864.

Twigs slender (2 mm.), scarcely fluted, for a time tomentose. Leaves deciduous, ovate-lanceolate, aristately subacute, more or less cordate, entire to aristately few-toothed above, small (1.5×4 to 2×6 cm.), glabrate and somewhat venulose above, more or less scurfy-tomentose beneath; veins about 6–8×2, scarcely looped; petiole hairy, scarcely 1×5 mm. Catkins: ♂, 50–60 mm. long, very openly flowered; ♀, 20 mm. or less long, few-flowered at end. Fruit biennial?

Mexican table-land.

Specimens examined.—Moran (*Bonpland*, the type).

TRISTES.—Moderately large trees with slender glabrous twigs, conical buds, medium-sized elliptical or lanceolate or oblong short-petioled chiefly entire or crenate leaves impressed-veiny above and nearly or quite glabrate with granular-bullate surface beneath, and annual short-stalked medium-sized fruit with blunt appressed canescent scales.—Central American region.

Leaves elliptical-oblong or oblanceolate, mostly obtuse.
  Entire or crisply repand.
    Twigs gray; petioles slender.
      Leaves quickly glabrous beneath ..... *Q. tristis.*
      Leaves fleecy along the veins ..... f. *mixcoensis.*
    Twigs reddish; petioles rather stout ..... f. *Niederleini.*
  Coarsely toothed.
      Elongated oblanceolate-oblong ..... f. *sublobata.*
      Shortly elliptical-obovate ..... f. *vulcani.*
Leaves lanceolate, very acute ..... *Q. Scherzeri.*

QUERCUS TRISTIS Liebmann.

Plate 341 to 343.

Quercus tristis Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854. p. 174.—Liebmann-Oersted, Chênes Amér. Trop., p. 23.
Q. castanea in part A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 72, 1864.

Twigs slender (2 mm.), fluted, glabrous, gray with more or less evident lenticels. Buds rather dull light brown, glabrescent, acutely conical-ovoid, 2×3–4 mm. Leaves deciduous?, narrowly oblong-elliptical and rather obtuse varying into oblanceolate and rather acute, variously rounded or acute at base, crisped, slightly sinuate and without marginal awns to aristately crenate above, moderate (2–4×8–12 cm.), glabrous, somewhat glossy and impressed-veiny above, paler, glabrescent except for the more or less brown-fleecy axils, and bullate-granular beneath; veins about 12×2, looped; petiole glabrous, 1×5–10 mm. Catkins?. Fruit annual, solitary or paired on a glabrous stalk scarcely 10 mm. long; cup rather umbonately half-round, moderate (15 mm. in diameter), with thin appressed blunt for a time gray-puberulent scales; acorn ovoid, typically 12 mm. long, less than half-included.

Central American region.

Specimens examined.—Guatemala. Without locality (*v. Warscewicz, 12, 14*, the types, also *13, 49*, larger-leaved, the former with acorns 10×15 and the latter with acorns 15×20 mm.—*v. Warscewicz 10*, with oblanceolate leaves 4×12 cm., rather deeply serrate above, represents f. **sublobata,** the type of *Q. castanea sublobata* A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 72, 1864, to which would also be referred *Skinner, 2*, 1845, at Kew); Naranjo (*Hayes*, 1860); Mixco to Antigua (*Trelease, 56, 58*); Acatenango (*Kellerman, 4833*). El Salvador. Volcan de San Salvador, at 2,300 m. (*Niederlein*, Jan. 9, 1898, f. **Niederleini,** with redder twigs, slightly longer buds, and stouter short petiole).

Sterile shoots from the volcano Cacaya, Guatemala (*Scherzer*, in the Vienna herbarium), with elliptical or oblong undulate to mostly sharply serrate leaves 2.5–4×8–12 cm., may be

differentiated under the form name **vulcani.** Otherwise typical material with fleecy veins beneath from above Mixco, Guatemala (*Trelease, 31*), may be known as f. **mixcoensis.**

Though Liebmann mentions a specimen collected by himself at Mirador, in Mexico, under *Q. tristis*, before citing the Guatemalan specimens, his description so closely fits the latter as to leave no doubt as to the application of his name in a necessary division of what he included under *tristis*.

It is to be noted that a segregate of the European *Q. sessiliflora* has been called *Q. tristis* by Gandoger, Flora Europae, vol. 21, p. 34, 1890.

Quercus Scherzeri n. sp.

Plate 343.

Twigs slender (2 mm.), little fluted, soon glabrous, grayish, with small prominent brown lenticels. Buds dull brown, glabrescent, ovoid, 2×3 mm. Leaves deciduous?, lanceolate to oblanceolate, subaristately acute, rounded at base, somewhat crisped, narrowly revolute, entire or with 1–3 short bristles or low serratures above, small (2–2.5×6–8 cm.), glabrous or with puberulent midrib and impressed-venulose above, dull, bullate-granular and glabrescent or floccose along the midrib below; veins about 12–14×2, looped; petiole more or less fleecy, 1×5 mm. Catkins?. Fruit annual, solitary or paired, nearly sessile; the young cups round, with thin appressed broad blunt at first gray-hairy scales.

Central American region.

Specimens examined.—Honduras. Comayagua (*Scherzer*, Apr., 1854, the type in the Vienna herbarium).

CONSOCIATAE.—Moderate-sized trees with slender glabrate twigs, ovoid buds, small elliptical short-petioled entire glabrous leaves somewhat pinnately impressed above and raised-venulose, and annual rather small fruit with blunt appressed tomentulose scales.—Central American region.

Leaves rather acute at both ends.....*Q. Wesmaeli.*
Leaves rounded at both ends.....*Q. consociata.*

Quercus Wesmaeli n. sp.

Plate 344.

Twigs rather slender (2–3 mm.), somewhat fluted, quickly glabrous and reddish, or remaining matted-tomentose nearly through the first season. Buds dull light brown, glabrous, more or less prismatic-ovoid, 2×3 mm. Leaves deciduous, elliptical, either blunt or acute at both ends, entire, revolute, small (2×6 cm.), glabrous and glossy above, dull and glabrescent or with axillary tufts beneath; veins about 8×2, forking and looped near the margin; petiole glabrescent, 3–5 mm. long. Catkins: ♂, 60 mm. long, woolly, closely flowered, the glabrous oblong anthers little exserted. Fruit annual?, solitary or paired on short stout peduncles; cup shallow-cup-shaped, moderate (12–15 mm. in diameter), with thin appressed rather blunt dull brown glabrescent scales; acorn ovoid, 15 mm. long, scarcely one-third included.

Central American region.—A small tree.

Specimens examined.—Costa Rica. Potrero del Alto, Volcan de Poas, at 2,460 m. (*Pittier, 773*, January, 1889, the type, *2036*); Guanacaste (*Pittier, 2607*); Copey (*Tonduz, 11827*).

As von Seemen has pointed out in the Bulletin de l'Herbier Boissier, ser. 2, vol. 4, p. 652, 1904, *Q. oleoides* and a black oak occur exasperatingly intermixed under several Pittier numbers, apparently through accident. Since *Q. Pittieri*, as the mélange is there called, was published as a name only, it is abandoned, and the second species is here named by itself.

Quercus consociata, n. sp.

Plate 345.

Twigs slender (2 mm.), somewhat fluted, soon glabrous, gray with sparse brown lenticels. Buds brown, glabrescent, acutely ovoid, scarcely 2×3 mm. Leaves deciduous, elliptical, very obtuse, rounded at base, entire, scarcely crisped or revolute, small (1.5–2.5×4–7 cm.), slightly

glossy and glabrous above, paler, dull, bullate-granular and exceptionally slightly fleecy beneath; veins about 10–12×2, rather distinctly looped; petiole glabrous, 3–4 mm. long. Catkins ?. Fruit annual, solitary, or in pairs on very short thick stalks; cup shallow, rather small (12 mm. in diameter), with thin appressed, blunt, finally glabrate and brown scales; acorn oblong-ovoid, about 12–15 mm. long, not over one-fourth included.

Central American region.

Specimens examined.—Guatemala. Without indication of locality (*v. Warscewicz, 9*, the type, in the Berlin herbarium).

MEXICANAE.—Small or medium-sized trees with slender from tomentose usually glabrescent twigs, ovoid buds, medium-sized or small generally lanceolate or oblong rather short-petioled mostly entire leaves detachably tomentose or glabrate beneath, the denuded surface granular-bullate, and mostly biennial rather short-stalked medium-sized fruit with blunt appressed canescent scales.—Mexican table-land.

Leaves elliptical-oblong or lanceolate with impressed veins above, entire.
- Cup not inrolled.
  - Leaves narrow (1–2 cm.).
    - Leaves moderate for the group, tomentose beneath.
      - Cup 15 mm. in diameter ..... *Q. mexicana.*
      - Cup 12 mm. in diameter ..... f. *perfertilis.*
    - Leaves relatively narrow.
      - Rather equally spaced.
        - Tomentose beneath ..... f. *angustifolia.*
        - Glabrate ..... f. *glabrata.*
      - Crowded at the end ..... f. *confertifolia.*
  - Leaves relatively broad, at first tomentose beneath.
    - Obtuse ..... f. *Bonplandi.*
    - Mucronately subacute ..... f. *lanosa.*
  - Leaves broad (2–3 cm.).
    - Soon glabrous, rather large ..... *Q. imbricariaefolia.*
    - Tawny-tomentose beneath, smaller.
      - Blunt ..... *Q. colimae.*
      - Acute ..... f. *Zauzillo.*
- Cup inrolled at margin.
  - Leaves narrow (1–2 cm.) ..... *Q. crassipes.*
  - Leaves broad (2–3 cm.) ..... *Q. malifolia.*

Leaves elliptical-obovate, quickly glabrous, with less-impressed veins.
- Fruit biennial; leaves entire ..... *Q. obovalifolia.*
- Fruit annual; leaves sometimes aristately low-toothed.
  - Leaves flat ..... *Q. axillaris.*
  - Leaves crisp ..... *Q. subcrispata.*

QUERCUS MEXICANA Humboldt and Bonpland.

Plates 345 to 347.

Quercus mexicana Humboldt & Bonpland, Plant. Aequinoct., vol. 2, p. 35, pl. 82, 1809.
Q. castanea mexicana A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 72, 1864.
Q. castanea integra Oersted, Bidrag Kundsk. Egefamil., p. 362, 1871.

Twigs slender (2 mm.), somewhat fluted, from dingy stellate-tomentose glabrescent and brown or gray. Buds glossy brown, glabrescent, round-ovoid, 1×2 mm. Leaves deciduous, elliptical or in some forms oblong, rather acute, round-based or somewhat cordate, entire, revolute, small (1.5–2.5×5–8 or even 10 cm.), glossy and glabrate above except for the somewhat puberulent midrib, detachably tomentose beneath, with the denuded surface granular-bullate; veins about 20×2, repeatedly forking and looped; petiole scurfy or glabrescent, about 5 mm. long. Catkins: ♂, 25 mm. long, tawny-lanate, rather compactly flowered, the ellipsoid anthers little exserted; ♀, scarcely 5 mm. long, 1- or 2-flowered at the end. Fruit biennial, solitary or paired on a stalk some 2–3×5 mm.; cup round, moderate (15 mm. in diameter), with close blunt often glabrate and glossy brown scales somewhat thickened below or with outcurved margins; acorn short-ovoid, fully half-included.

Mexican table-land and adjacent cordillera.—A tree 6–10 or even 15–20 m. high.

Specimens examined.—Sta. Rosa (*Bonpland, 4060*, the type, *4218; Deppe, D; Schiede 17, 1379; Pavon; Uhde, 301–2*); Moran (*Bonpland, 4163*); Guanajuato (*Bonpland, 4409*); Real del Monte (*Ehrenberg, T–V, X, 261, 892*); Pachuca (*Pringle, 10290*); S. Pedro & S. Antonio (*Karwinski*); Cristo (*Karwinski*, Sept., 1827); Tula (*Berlandier, 1239*); Cajalpa (*Hahn, 366b*); valley of Mexico (*Bourgeau*, Oct. 11, 1865; *271* in part; *Schmitz, 775*). Cultivated at Berlin (*Herb. A. Braun*, 1851; *Paul*, 1861), and at Carelew, England (*Henry, 3*).

In its narrowest-leaved form, with leaves scarcely 1.5 cm. wide but sometimes as much as 7 cm. long, it is f. **angustifolia**, hardly differing from the next except in greater pubescence on the lower face of the leaves: Sta. Rosa (*Bonpland*, the type of *Q. crassipes angustifolia* Humboldt & Bonpland, Plant. Aequinoct., vol. 2, p. 38, pl. 84, 1809). The more glabrous form of this, f. **glabrata**, occurs from El Jacal (*Bonpland*), Guadalaxara (*Galeotti, 118*), and Sta. Fé (*Bourgeau, 424, 1015*). With more crowded leaves, this narrow-leaved form is f. **confertifolia**, from Sta. Rosa (*Bonpland*, the type of *Q. confertifolia* Humboldt & Bonpland, Plant. Aequinoct., vol. 2, p. 53, pl. 94, 1809.—A de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 74; *Dugès, v*).

A specimen from Mt. Orizaba (*Rose & Hay, 5675*) with nearly typical foliage but very abundant small fruit, the cups about 12 mm. in diameter, may bear the name f. **perfertilis**.

The broader-leaved differentials are: f. **Bonplandi**, with very fleecy leaves as much as 2×6 or even 10 cm., which occurs without locality (*Bonpland; Hahn, 14*, 1869), and f. **lanosa**, with equally broad leaves with dense but easily removable tomentum beneath, and somewhat revolute-margined cup-scales, from Tlalpuxahua (*Hartweg, 431*).

Quercus imbricariaefolia n. sp.

Plate 348.

Twigs moderate (3 mm.), little fluted, glabrescent with little-evident lenticels. Buds glabrescent, acutely ovoid, 2×2–3 mm. Leaves deciduous, elliptical, rounded at both ends, more or less mucronate, entire, somewhat revolute, moderate (2–3×8–10 cm.), glabrous or with puberulent midrib and raised-venulose above, from fleecy glabrescent except in sheltered places and with granular-bullate surface beneath; veins about 15–20×2, often with evanescent intermediates, branched and evidently though irregularly looped; petiole rather glabrescent, about 5 mm. long. Catkins ?. Fruit biennial, solitary on a stalk some 4×5 mm.; cup rather turbinate, moderate (15 mm. in diameter), with thin rather squarrose blunt hoary scales; acorn round-ovoid, 15 mm. long, fully half-included.

Mexican table-land and adjacent cordillera.—A tree 15–20 m. high, with weak wood, called encino manzanillo.

Specimens examined.—Real del Monte (*Endlich, 1012*, the type, in the Berlin herbarium; *Streator*, 1891); valley of Mexico (*Bourgeau, 425*).

Quercus colimae n. sp.

Plate 349.

Twigs slender (2 mm.), somewhat fluted, rather persistently scurfy, with scarcely evident lenticels. Buds rather dull red brown, glabrescent, ovoid, about 2×3 mm. Leaves deciduous, elliptical, rounded at both ends, for a time mucronate, entire, revolute, small (1.5–2.5×4–7 cm.), glabrous above except for the puberulent midrib and raised-venulose except that the primaries and some secondaries are impressed toward the margin, detachably tawny-fleecy beneath, the denuded surface bullate-granular; veins about 15×2, unequal, branched and irregularly looped; petiole puberulous, scarcely 5 mm. long. Catkins ?. Fruit biennial, solitary or paired on very short stalks; cup half-round or somewhat contracted toward the base, rather large (20 mm. in diameter), with somewhat thick-based appressed bluntly acuminate glabrescent and brown scales; acorn ovoid, nearly 20 mm. in diameter, about half-included.

Western Sierra Madre region of Mexico.—A rather small tree with soft pink or maroon wood, called encino blanco or blanco chino.

Specimens examined.—Cerro Grande, Jalisco, at 2,000 to 2,600 m. (*Burnett*, the type in the herbarium of the United States Forest Service).

An acute-leaved variant, called zauzillo or chililló, occurring with the type, may be called **f. Zauzillo.**

QUERCUS CRASSIPES Humboldt and Bonpland.

Plates 350 and 351.

Quercus crassipes Humboldt & Bonpland, Plant. Aequinoct., vol. 2, p. 37, pl. 83, 1809.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 73.

Twigs rather slender (2–3 mm.), fluted, glabrate, with small pale lenticels. Buds brown, glabrous, rounded, 2–3 mm. in diameter. Leaves deciduous, elliptical-oblong, mucronate, obtuse or acute, round-based or somewhat cordate, entire, revolute, small (1.5–2×5–8 cm.), glabrate or pubescent along the midrib above, denudably tomentose beneath, the denuded surface granular-bullate; veins about 15×2, often with evanescent intermediates, impressed above, forking toward the margin and looped; petiole glabrescent, about 5 mm. long. Catkins ?. Fruit biennial, mostly paired on a stalk some 5×10 mm.; cup turbinate, rather large (15–20 mm. in diameter), with thin, close, blunt, glabrescent scales, its margin usually inrolled; acorn ovoid, half-included.

Mexican table-land and adjacent cordillera.

Specimens examined.—Near Sta. Rosa (*Bonpland*, the type); Guanajuato (*Dugès*, 1902); East of Lerma (*?Gregg, 703*); Real del Monte (*Ehrenberg, 893*); Sta. Rosa to Desierto (*Endlich, 378*); Tulancingo (*Nelson, 1*, 1893); Hacienda de la Encarnacion (*Rose, Painter & Rose, 8439*); Cajalpa, near Toluca (*Hahn, 346, 349, 354*); Tlalpuxahua (*Keerl*, 1829); valley of Mexico (*Pringle, 6670, 6997; Bourgeau, 224, 427, 744, 1139, 1140; Ross, 190*); Mt. Ajusco (*?Lemmon, 100*); Manzanillo, Puebla (*Arsène, 3527*); El Oro (*?Rangel 5924 bis*); without locality (*Pavon* [12]*; Hahn*, 1868; *Uhde, 290, 303; Schmitz, 566, 598–9*).

Quercus malifolia n. sp.

Plate 348.

Twigs rather slender (2–3 mm.), somewhat fluted, dingy gray-tomentose. Buds glossy brown, glabrescent, ovoid, 2×3 mm. Leaves deciduous ?, elliptical, mucronately rather obtuse, rounded at base or subcordate, entire, somewhat crisped and revolute, moderate (3–4×6–10 cm.), glossy deep green and glabrous above except for the scurfy midrib, detachably dingy-tomentose beneath, the denuded surface scarcely raised-bullate; veins about 10–12×2, repeatedly forking and irregularly looped; petiole stellate-hairy, 2×3 mm. Catkins ?. Fruit biennial, solitary or paired on somewhat hoary peduncles scarcely 2×10 mm.; cup turbinate, moderate (15 mm. in diameter), with somewhat thick-based rather revolute-margined blunt gray- or brown-puberulent scales, its margin incurved; acorn ovoid, 12 mm. in diameter, more than half-included.

Mexican table-land.

Specimens examined.—Above San Andres Chalchicomula, Mt. Orizaba, at 3,000 m. (*Ross, 256*, the type); Orizaba (*?Smith, 157*).

Quercus obovalifolia Fournier, n. sp.

Plate 351.

Quercus obovalifolia Fournier in herb.

Twigs slender (2 mm.), little fluted, from scurfy glabrate, with small pale lenticels. Buds brown, glabrous, ovoid, scarcely 2×3 mm. Leaves deciduous, elliptical ranging into obovate, mucronate, very obtuse, round-based, entire, at most minutely subrevolute, small (1.5–2.5×3–6 cm.), glossy, glabrate except for fleece along the midrib beneath, the denuded surface granular-

[12] Were it not for the very striking leaf sketched by Lange in the Née collection as *Q. castanea*, agreeing in its toothing with the description of that species, I should be disposed to accept this name for the present species, in which case *mucronata* would be taken for what is called *castanea* below. This Pavon specimen, and that ascribed to *Mexicana*, may well have been collected by Née.

bullate; veins about 10–12×2, frequently with fainter evanescent intermediates, somewhat impressed above, forking and more or less distinctly looped; petiole somewhat pubescent, scarcely 5 mm. long. Fruit biennial, solitary or paired on a stalk some 3×5 mm.; cup turbinately cup-shaped, moderate (15 mm. in diameter), with thin appressed blunt glabrescent scales; acorn ovoid, nearly half included.

Cordilleran region of Mexico.

Specimens examined.—Valley of Mexico (*Bourgeau, 1014*, the type).

Quercus axillaris Fournier, n. sp.

Plate 352.

Quercus axillaris Fournier in herb.

Twigs slender (2 mm.), fluted, glabrate, with small pale lenticels. Buds glabrate, ovoid, 2×3 mm. Leaves deciduous, obovate-elliptical, obtuse with short awn, rather rounded at base or obliquely subtruncate or subcordate, low-crenate above with short bristles, minutely revolute, rather small (3–4×5–7 or 10 cm.), glabrate above, somewhat scurfy beneath, the denuded surface bullate-granular; veins about 8×2, branched and obscurely looped; petiole glabrate, about 1×10 mm. Catkins?. Fruit annual, solitary, subsessile; cup half-round, rather small (12 mm. in diameter), with thin appressed blunt glabrate brown scales; acorn round-ovoid, half-included.

Cordilleran region of Mexico.

Specimens examined.—San Nicolas, valley of Mexico (*Bourgeau, 1138*, the type, and *1136*).

Quercus subcrispata n. sp.

Plate 353.

Twigs slender (2 mm.), fluted, quickly glabrous, reddish, with minute inconspicuous lenticels. Buds brown, glabrate, ovoid, acute, 2×3 mm. Leaves deciduous, elliptic-oblong or somewhat widened upwards, subacute with a short awn, subcordately truncate at base, entire or very obscurely serrulate at the tips of the veins or the latter excurrent as awns, minutely revolute, more or less crisped, small (little over 2×5 cm.), glabrous, glossy and low-cancellate above, detachably tomentulose beneath, the denuded surface bullate-granular; veins about 8×2, branched and somewhat looped; petiole glabrate, scarcely 5 mm. long. Catkins?. Fruit annual, mostly solitary, subsessile; cup half-round, rather small (12 mm. in diameter), with thin appressed blunt glabrate brown-scales; acorn round-ovoid, half-included.

Cordilleran region of Mexico.

Specimens examined.—Manzanilla, Puebla (*Arsène, 5926*, the type as sheet *1002436* in the U. S. National herbarium).

LANIGERAE.—Trees with slender at first tomentose twigs, ovoid or elongated buds, elliptical or oblong or lanceolate entire or serrulate or serrately incised small or moderate slender-petioled leaves impressed-veiny above and downy or detachably tomentose beneath with the denuded surface bullate-granular, and rather small annual short-stalked fruit with thin appressed bluntish scales.—Eastern Sierra Madre and adjacent cordillera of Mexico.

Leaves persistently downy beneath, fine-toothed.
  Leaves with few and subapical teeth, or none.....*Q. lanigera.*
  Leaves more toothed and larger..... f. *siderozyloides.*
Leaves detachably fleecy beneath, coarse-toothed ..... *Q. circummontana.*

QUERCUS LANIGERA Martens and Galeotti.

Plates 354 and 355.

Quercus lanigera Martens & Galeotti, Bull. Acad. Brux., vol. 10, part 1, p. 215, 1843.—Liebmann-Oersted, Chênes Amér. Trop., pl. E.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 73.

Twigs short and slender (2 mm.), somewhat fluted, from finely gray stellate-lanose glabrescent, brownish or gray with evident lenticels. Buds somewhat glossy brown, glabrescent, round-ovoid, 2×3 mm. Leaves deciduous, elliptical to oblong, aristate, acute or blunt, rounded

at base, entire or with a few aristate teeth above, small (2–3×5–6 cm.), glossy and glabrous above or the midrib somewhat tomentulose, detachably gray-fleecy beneath, the denuded surface bullate-granular; veins about 10×2, somewhat obscurely looped; petiole glabrescent, 1×5–10 mm. Catkins rusty-tomentose: ♂, scarcely 30 mm. long, rather loosely flowered, the glabrous ellipsoid anthers scarcely exserted; ♀, scarcely 10 mm. long, 1- or 2-flowered. Fruit annual, solitary or paired on a short stalk; cup (immature) somewhat turbinate, small (scarcely 10 mm. in diameter), with thin appressed blunt canescent scales becoming more or less glabrous and then glossy brown; acorn subglobose, nearly included.

Cordilleran region of Mexico.

Specimens examined.—Oaxaca. Mixteca Alta, at 2,100–2,600 m. (*Galeotti, 104*, 1840, the type, *100*, in the Delessert herbarium, *112*); Cerro de S. Felipe (*Liebmann, 96, 3460, 3498*); Cuesta de S. Juan del Estado (*Liebmann 3459*); Capulalpan (*?Galeotti, 6, 10, 12*), Cumbre de Istepec (*Liebmann, 93, 94, 3457*, with broader repand leaves 3–4×8 cm.); Cerro de S. Antonio (*Conzatti, 1415*). Puebla. Cerro del Gavilan (*Purpus 4089*, from which the fruit is described). Manzanillo (*Nicolas*, 1912). A form with larger more toothed leaves from Manzanillo (*Nicolas*, 1912) may be called f. **sideroxyloides.**

Quercus circummontana n. sp.

Plate 356.

Twigs rather slender (2–3 mm.), fluted, glabrate, rather glossy, blackish with small brown lenticels. Buds glossy reddish brown, glabrous, at length elongated ovoid and 3×5 mm. Leaves elliptical-oblong and acute, varying into obtusely obovate, round-based to cordate, setose-ciliate to low or even deeply serrate above with setose teeth, slightly revolute, moderate (2–3×6–10 cm.), glossy and glabrous above, detachably gray-floccose beneath, the denuded surface bullate-granular; veins about 8×2, branched but indistinctly if at all looped; petiole glabrate from tomentose, 5–10 mm. long. Catkins?. Fruit annual, mostly paired on a stalk 2×10–15 mm.; cup shallowly rather turbinate, moderate (15 mm. in diameter), with thin rather loose blunt hoary scales, brown when glabrate; acorn ovoid, scarcely one-third included.

Eastern Sierra Madre region of Mexico.

Specimens examined.—Mirador (*Liebmann, 3454, 86, 3455*, the type; *Heller, 12*); Zacuapam (*Galeotti, 97*); Totutla (*Linden, 1149*). Orizaba (*Mueller, 1210*); Maltrata (*Kerber, 201*); Mte. de Pacho, Jalapa (*Schiede*, May, 1829, with leaves nearly entire and dilated upwards as in *pandurata*, but setose from the upper veins); Jalapa (*Linden, 143*); without locality (*Schiede, 16; Ghiesbreght, 4, 9; Graham, 333*); Tiristiran, between Morelia and Zamora (*?Gregg, 797*).

The specimen cited as type is one of those designated by Liebmann under *Q. tristis*, to the description of which latter the very distinct Guatemalan material corresponds.

FOURNIERIAE.—Small trees with rather slender tomentose twigs, ovoid buds, rather small ovate or oblong acute entire moderately petioled leaves impressed-veiny above and short-tomentose beneath, and biennial subsessile medium-sized fruit.—Eastern Sierra Madre region of Mexico.

Leaves ovate-oblong, acute.....*Q. Fournieri.*

Quercus Fournieri n. sp.

Plate 357.

Quercus ferruginea Fournier in herb.—Not *Q. ferruginea* Michaux, f. Hist. Arb. Amér., vol. 2, p. 92, pl. 18, 1812.

Twigs moderate (3 mm.), fluted, from rusty-tomentose persistently dingy-canescent. Buds brown, rather persistently hairy, ovoid, 2×3 mm. Leaves deciduous, elliptical to subovate, mucronately acute, obliquely truncate at base or cordate, entire, somewhat crisped and revolute, small (2–3×5–6 cm.), glossy above and glabrous except for the puberulent midrib, detachably rather long rusty-tomentose beneath, the denuded surface granular-bullate; veins

about 12×2, with several evanescent intermediates, forking and somewhat obscurely looped; petiole tomentose, 2×5 mm. Catkins?. Fruit biennial, solitary or paired on a tomentose peduncle scarcely 10 mm. long; cup half-round, moderate (15 mm. in diameter), with thin somewhat loose blunt canescent scales; acorn ovoid, nearly included.

Eastern Sierra Madre region of Mexico.

Specimens examined.—Foot of Cofre de Perote (*Hahn, 255*, June, 1866, the type in the herbarium of the Muséum d'Histoire Naturelle at Paris).

CASTANEAE.—Small trees with rather slender from tomentose glabrate twigs, ovoid-subconical buds, medium-sized or small generally lanceolate mostly aristately serrulate rather short-petioled leaves finely impressed-venulose above and stellate-tomentose beneath, and annual short-stalked medium-sized fruit with blunt appressed canescent scales.—Mexican table-land and western Sierra Madre region.

Pubescence firmly attached.
- Leaves oblong-lanceolate or oblanceolate.
  - Eastern.
    - Leaves acute, bristly toothed ..... *Q. castanea.*
    - Leaves elliptical-obovate, obtuse, entire ..... v. *elliptica.*
    - Leaves rather oblong and obtuse, serrate ..... *Q. pulchella.*
  - Western; leaves acute, toothed.
    - Petioles very slender; point prolonged ..... *Q. serrulata.*
    - Petioles rather stout; point short ..... *Q. alamosensis.*

Tomentum easily detachable, the denuded surface granular-bullate.
- Leaves elliptical or oblong-obovate; western.
  - Somewhat toothed ..... *Q. Rossii.*
  - Entire and small ..... f. *Arsenei.*
- Leaves more lanceolate; eastern.
  - Leaves moderately small; southern ..... *Q. tepoxuchilensis.*
  - Leaves very small; northern ..... *Q. simillima.*

QUERCUS CASTANEA Née.

Plates 358 and 359.

Quercus castanea Née, Anal. Cienc. Nat., vol. 3, p. 276, Mar., 1801.—Liebmann-Oersted, Chênes Amér. Trop., pl. 7, 9—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 72.—Not *Q. castanea* Mühlenberg, Neue Schr. Gesellsch. Naturf. Fr., vol. 3, p. 396, 1801.

Q. mucronata Willdenow, Sp. Plant., vol. 4, p. 436, 1805, but not of his herbarium.

Twigs rather slender (2–3 mm.), fluted, from somewhat loosely hairy glabrescent, glossy reddish or gray with small brown lenticels. Buds rather glossy brown, glabrous, ovoid, finally 2×3–4 mm. Leaves deciduous?, elliptical-lanceolate to oblong or somewhat widened upwards or downwards, aristately acute, rounded at base or slightly cordate, entire to typically aristately low-serrate above, moderate or rather small (2.5–4×7–9 cm.), glossy and glabrous above or somewhat granular-scurfy along the midrib, dull and minutely but persistently dingy-stellate beneath; veins about 10×2, forked and rather distinctly looped; petiole more or less glabrescent, 5 mm. long. Catkins?. Fruit annual, solitary or several on a peduncle 3×10 mm.; cup half-round, rather small (12 mm. in diameter), with thin appressed blunt more or less persistently gray-puberulent brown scales; acorn round-ovoid, 10 mm. long. half-included.

Mexican table-land, the type from between Ixmiquilpan and Zimapan and Acambaro.[1]—A gray-barked tree some 4 m. high.

Specimens examined.—Near Pinoleo (*Ehrenberg, W, 1212*); Cuesta de Pinoleo (*Ehrenberg, 1171*); Sta. Rosa to Desierto (*?Endlich, 376 b*); without locality (*Uhde, 304*); Cañada (*Schmitz, 776*). With elliptical or slightly obovate leaves becoming some 4–8 cm., and typically quite entire it is var. **elliptica**: Los Baños, near Real del Monte (*Ehrenberg, 987*).

[1] "Quercus foliis sublanceolatis, subcordatis, serratis serraturis aristatis, supra nitidis, subtus tomentosis."—Née, *l. c.*

QUERCUS PULCHELLA Humboldt and Bonpland.

Plate 360.

Quercus pulchella Humboldt & Bonpland, Plant. Aequinoct., vol. 2, p. 44, pl. 88, 1809.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 34.

Twigs slender (2 mm.), more or less fluted, from gray-tomentose glabrescent with dark small lenticels the second season. Buds dark brown, hairy above or glabrescent, ovoid, 2×3 mm. Leaves deciduous, elliptical-oblong or obovate, rather obtuse, rounded at base or subtruncately shallowly cordate, pungently serrate, minutely revolute, small (2–3×4–6 cm.), glabrous and glossy above with impressed veins, densely yellowish-tomentose beneath; veins about 7–9×2, sometimes forking but scarcely looped; petiole puberulent or more or less glabrate, 1.5×5–8 mm. Catkins ?. Fruit apparently annual, the partly grown cup with thin appressed glabrous and glossy red-brown scales.

Mexican table-land.

Specimens examined.—Guanajuato to Sta. Rosa (*Bonpland*, the type, in the herbarium of the Muséum d'Histoire Naturelle at Paris); Jesus Maria, S. L. P. (*Nelson, 4*).

Here are referred doubtfully an assemblage of granular-bullate forms, evidently closely related to *Q. tepoxuchilensis* but with smaller fruit scarcely 15 mm. in diameter, from the Cerro Tepoxuchil, near Puebla, in the cordillera (*Arsène, 4, 106, 112, 2068, 2100, 5058, 5923, 5927, 7053*).

The name *pulchella* has been applied specifically to a segregate of the European *Q. lanuginosa* by Gandoger, Fl. Europ., vol. 21, p. 43, 1890.

Quercus serrulata n. sp.

Plate 361.

Twigs slender (2 mm.), fluted, from finely scurfy glabrescent and brown with inconspicuous lenticels. Buds brown, glabrescent, ovoid, small. Leaves deciduous, oblanceolate-oblong, acute or somewhat acuminate, obliquely rounded or truncate at base, setaceously serrulate, especially upwards, small (1.5–3×5–8 cm.), glabrous and very glossy above or the midrib puberulent, creamy-puberulent beneath; veins about 10–12×2, scarcely looped; petiole tomentulose, 1×5–10 mm. Catkins: ♀, scarcely 5 mm. long, scurfy, 1- or 2-flowered, with filiform styles. Fruit ?.

Western Sierra Madre region of Mexico.

Specimens examined.—Chiquilistlan, Jalisco (*Jones, 445*, May 28, 1892, the type, in the United States National herbarium).

Quercus alamosensis n. sp.

Plate 361.

Twigs slender (2 mm.), somewhat fluted, from dingy-fleecy becoming only slightly hoary. Buds red-brown, somewhat cobwebby, elongated ovoid, 2×4 mm. Leaves deciduous, broadly oblong or somewhat widened upwards, acute, somewhat cordate, low-serrate, small (2.5×7 cm.), glabrous and glossy though usually somewhat papillate above, sparsely stellate-tufted and dull beneath; veins about 10×2, obscurely looped, the veinlets scarcely evident above but very prominent beneath; petiole somewhat fleecy, scarcely 1.5×5 mm. Flowers and fruit ?.

Western Sierra Madre region of Mexico.

Specimens examined.—Sierra de los Alamos, Sonora (*Palmer, 370*, 1890, the type).

Quercus Rossii n. sp.

Plate 362.

Twigs slender (2 mm.), fluted, from dingy stellate-tomentose glabrescent, somewhat glossy red with prominent brown lenticels. Buds brown, glabrescent, ovoid, 2 mm. in diameter. Leaves deciduous, lance- or oblong-obovate, mostly acute, rounded at base or slightly cordate, usually low-serrate typically with aristate teeth and moderate (2.5–5×6–10 cm.), exceptionally

6×14 cm. and unequally dentate, glossy and glabrous above or somewhat sparsely stellate and with the midrib scurfy, paler, dull, and pale puberulent or short-tufted beneath with the denuded surface bullate-granular; veins about 10×2, branched, at most obscurely looped; petiole glabrescent, 1×5–10 mm. long. Catkins ?. Fruit annual on a glabrescent stalk some 5 or 10 mm. long; cup rather shallow, moderate (15 mm. in diameter) with thin appressed ashen or nearly glabrous and brown scales; acorn ovoid, half-included.

Western Sierra Madre region of Mexico.—A tree 10–15 m. high, yielding a maroon or blackish useful wood, and tan bark. Called encino prieto or encino colorado.

Specimens examined.—Araparicuaro, Ario de Rosales, Michoacan, at 2,000 m. (*Endlich, 1355*); Sierra de S. Andres, Michoacan, at 2,000–2,500 m. (*Ross, 374*, Aug., 1906, the type); Jaripeo, Michoacan (*Arsène, 33*); La Joya, Colima, etc. (*Ross, 505, 516*); Near Colima (*Fernow, 3*), Cerro Grande, Jalisco, at 2,000–2,500 m. (*Burnett*); Bolaños, Jalisco (*Rose, 3732*); Sta. Teresa, Tepic (*Rose, 3398*, Aug. 10, 1897, with the slender petioles 15 mm. long and except in pubescence recalling *Q. axillaris*); Tixtla (*Pavon*, probably collected by Née and the western representative of his *Q. elliptica*, here joined with *castanea*). With elliptical-oblong small leaves (1–2×3–5 cm.), from Jaripeo, Michoacan ((*Arsène, 30, 5913, 6004*) it is f. **Arsenei.**

Quercus tepoxuchilensis n. sp.

Plate 363.

Twigs slender (2–3 mm.), little fluted, gray- or rusty-tomentose through the first season. Buds glossy brown, glabrous, ovoid, 2×4 mm. Leaves deciduous, elliptical-oblong, subacute, obliquely truncate at base or cordate, entire but mucronate from the upper veins to repand or low-serrate, slightly revolute, rather small (2.5×6–8 cm.), glossy and glabrous above, lightly and detachably gray-flocculose beneath, the denuded surface bullate-granular; veins about 10×2, somewhat looped; petiole reddish, tomentose or glabrescent, 1×10 mm. Catkins ?. Fruit annual, solitary, nearly sessile; cup shallow cup-shaped, rather large (nearly 20 mm. in diameter), with thin appressed blunt tomentulose brown-margined scales; acorn ovoid, some 20 mm. long, scarcely one-third included.

Cordilleran region of Mexico.

Specimens examined.—Puebla. Tepoxuchil (*Arsène, 201*, 1906, the type, in the Berlin herbarium; *Nicolas*, 1909, 1911, *5926, 5927*); Tochimilco (*Nelson*, 1893).

Polymorphous, the typically large cup sometimes not over 15 mm. in diameter, and the leaves blunter and more elliptical. A form with small sharply aristately toothed leaves scarcely 1.5×5 cm., from the vicinity of Tepoxuchil is f. **perplexans** (*Arsène, 2068*).

Quercus simillima n. sp.

Plate 363.

Twigs slender (2 mm.), fluted, densely yellow-tomentulose the first season, becoming glossy red with scarcely evident lenticels and ultimately gray with finely checked bark. Buds red, glabrescent, ovoid, 2×3 mm. Leaves deciduous, elliptical to oblong or almost triangular, mucronately acute, cordate or subtruncate at base, sharply mucronately serrate above, small (1×2.5–3.5 cm.), glossy, glabrous or sparingly scurfy above, stellate-tufted beneath or glabrescent; veins about 7×2, obscurely looped; petiole rather persistently yellow-tomentose, red, 1×3 mm. Catkins: ♀, of 1 or 2 scarcely peduncled flowers, with oblong styles 1 mm. long. Fruit ?.

Mexican table-land.

Specimens examined.—Region of San Luis Potosi (*Parry & Palmer*, 1878, without number, the type, in the herbarium of the Missouri Botanical Garden); Jesus Maria, S. L. P. (*Nelson, 3*, in the U. S. National herbarium).

IMPRESSAE.—Small trees with slender glabrous twigs, ovoid buds, small ovate-lanceolate entire moderately petioled leaves impressed-veiny above and finely tomentose beneath, and biennial rather small fruit with rather acute appressed glabrescent scales.—Cordilleran region of Mexico.

Leaves subcordately rounded, very acute.....*Q. impressa.*

Quercus impressa n. sp.

Plate 364.

Twigs slender (2 mm.), somewhat fluted, from gray-tomentulose becoming glossy red with small brown lenticels. Buds rather glossy brown, glabrous, ovoid, 2×3 mm. Leaves somewhat evergreen, narrowly ovate, aristately acute, rounded at base or slightly cordate, entire, small (2×5 cm.), glabrous and very glossy above, with impressed areolation, from dull and dingy-flocculose glabrate and bullate-granular beneath; veins about 10×2, looped at some distance from the margin; petiole more or less scurfy, 1×5–10 mm. Catkins: ♂, 70 mm. long, loosely fleecy, rather laxly flowered, the glabrous mucronate ellipsoid anthers little exserted; ♀, 5–10 mm. long, 1- to 3-flowered. Fruit biennial, on a glabrescent glossy red peduncle scarcely 10 mm. long; cup nearly hemispherical, small (10 mm. in diameter), with thin appressed rather blunt slightly tomentulose scales; acorn acutely ovoid, 12 mm. long, less than half included.

Cordilleran region of Mexico.

Specimens examined.—Salome, Oaxaca (*Pringle, 6029*, Nov. 1, 1894, the type).

RUGULOSAE.—Moderately large trees with slender scurfy or glabrate twigs, ovoid conical buds, rather small elliptical or lanceolate entire rather short-petioled leaves finely venulose above and either stellate or glabrate beneath, and annual or biennial rather small fruit with thin appressed blunt somewhat puberulent scales.—Mexican table land.

Leaves very veiny beneath, glabrous ..... *Q. Seleri.*
Leaves less veiny.
  Fruit biennial.
    Leaves elliptical-oblong, rather blunt.
      Rounded or subcordate at base ..... *Q. rugulosa.*
      Truncate at base ..... *f. subtruncata.*
    Leaves broadly lanceolate, acute ..... *Q. roseovenulosa.*
  Fruit annual; leaves broadly lanceolate, acute ..... *Q. Sipuraca.*

Quercus Seleri n. sp.

Plate 364.

Twigs slender (2 mm.), fluted, from yellow-hairy glabrescent and apparently lightly glaucous. Buds brown, glabrous, round-ovoid, 2 mm. in diameter. Leaves deciduous?, ovate-lanceolate, acute, rounded at base or slightly cordate, entire or occasionally setaceous-serrate, somewhat crisped and slightly revolute, rather small (2–3 or 4×4–6 or 10 cm.), glossy above and glabrous or with somewhat yellow-hairy midrib, the duller lower face yellow-fleecy in sheltered places; veins about 15×2, forking and looped; petiole yellow-fleecy, scarcely 5 mm. long. Catkins: ♂, 60–70 mm. long, somewhat cobwebby, closely flowered, the glabrous ellipsoid anthers little exserted. Fruit?.

Western Sierra Madre region of Mexico.

Specimens examined.—Casa del Tepozteco, Morelos, at 2,000 m. (*Seler, 4302*, Oct. 24, 1914, the type, in the Berlin herbarium).

QUERCUS RUGULOSA Martens and Galeotti.

Plate 365.

Quercus rugulosa Martens & Galeotti, Bull. Acad. Brux., vol. 10, part 1, p. 209, 1843.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 74.

Twigs rather slender (2–3 mm.), fluted, from dingy scurfy-lanate glabrescent, reddish with scarcely evident lenticels. Buds brown, at first fleecy, ovoid, 2×3 mm. Leaves elliptical-oblong or somewhat widened upwards or downwards, mostly mucronately subacute to obtuse, rounded or truncate at base to shallowly cordate, entire, sometimes a little crisped, minutely revolute, rather small (some 2–4×4 or 6×9 cm.), glossy, sparingly and minutely stellate and finely raised-reticulate above, more densely and persistently stellate-scurfy beneath and granu-

lar when denuded; veins about 10×2, somewhat forked, at most obscurely looped at some distance from the margin; petiole more or less woolly, 1.5×5–10 mm. Catkins ?. Fruit biennial, solitary or paired on a peduncle scarcely 10 mm. long; cup somewhat turbinately cup-shaped, rather small (10–12 mm. in diameter), with thin appressed blunt golden-tomentulose scales; acorn (mature ?) depressed, scarcely emergent.

Mexican table-land.—A tree 15–20 m. high.

Specimens examined.—S. Pedro & S. Pablo, near Real del Monte, at 2,500 m. (*Galeotti, 116*, 1840, the type; *Ehrenberg, 902*); Sierra de Pachuco (*Pringle, 10295*).

What appears to be a form of this, occurs about San Luis Potosi (*Parry & Palmer, 839*, noted as a tree 5–7 m. high, yielding a tanbark), and, with narrower aristately long-acute almost truncate-based leaves, f. **subtruncata**, at Alvarez, S. L. P. (*Palmer, 70*, Sept., 1902).

Quercus roseovenulosa n. sp.

Plate 366.

Twigs slender (2 mm.), fluted, stellate-scurfy, dark reddish brown becoming grayish with small pale lenticels. Buds glossy reddish brown, glabrescent, ovoid-conical, 2×3 mm. Leaves deciduous, lance-elliptical, aristately acute or acuminate, rounded or truncate at base, entire, small (1.5–2×4–7 cm.), rather glossy and glabrous above except for the puberulent midrib, dull or with polished veins and glabrous beneath except for some axillary tufts; veins about 8–10×2, looped, the fine venulation pink and raised above; petiole scurfy, 1×5 mm. Catkins ?. Fruit biennial, solitary and nearly sessile; cup deep-saucer-shaped, rather large (20 mm. in diameter), with appressed acuminate glabrescent brown scales, the lower somewhat thickened; acorn oblong-ovoid, about one-third included.

Mexican table-land.

Specimens examined.—Dry hills, Salto de Agua, Mexico (*Purpus, 1797*, Oct., 1905, the type).

Quercus Sipuraca n. sp.

Plate 366.

Twigs slender (2 mm.), fluted, closely almost white-tomentose, remaining somewhat hoary for several years or glabrescent and red-barked. Buds glossy light brown, glabrescent, acutely ovoid, 1.5×2 mm. Leaves elliptical-ovate or oblong, aristately acute, cordate, entire, somewhat crisped, small (1.5–2.5×5–6.5 cm.), green and from sparsely stellulate glabrescent except for the puberulent midrib above, detachably light-gray tomentulose beneath, the abraded surface granular-bullate; veins about 10×2, branched and looping; petiole canescent, scarcely 5 mm. long. Catkins ?. Fruit annual, solitary or paired on a hoary stalk scarcely 5 mm. long; cup obconical, small (10 mm. in diameter), with thin close blunt soon brown scales; acorn round-ovoid, fully half-included.

Western Sierra Madre region of Mexico.—A tree 6–10 m. high, with very strong wood, called sipúraca, encino colorado, or encino cascalote.

Specimens examined.—Bajio de Tonachic, Chihuahua, at 2,350 m. (*Endlich, 1286*, Mar. 12, 1906, the type, in the Berlin herbarium); Basagote to Tascates, in the same mountains, at 1,800–2,000 m. (*Endlich, 790b*).

SALTILLENSES.—Moderate-sized trees with finally glabrate twigs, ovoid-conical buds, rather small ovate-lanceolate aristately acute chiefly entire slender-petioled leaves finely venulose above and for a time stellate beneath, and annual rather small fruit with thin appressed blunt somewhat puberulent scales.—Eastern Sierra Madre and cordilleran regions of Mexico.

Leaves broad (3 cm.), entire ..... *Q. acherdophylla.*
Leaves narrower (scarcely 2 cm.).
  Elongated (5–6 cm.), entire ..... *Q. saltillensis.*
  Short (3–4 cm.), sometimes aristately few-toothed ..... *Q. carnerosana.*

Quercus acherdophylla n. sp.

Plate 367.

Twigs rather slender (2–3 mm.), little fluted, from scurfy glabrescent, dull reddish brown with small prominent brown lenticels. Buds glossy brown, glabrous, ovoid, 2×3 mm. Leaves deciduous, ovate, aristately acute, rounded at base, entire, crisped and very slightly cartilaginous-revolute, rather small (2–3×6–7 cm.), from lightly gray-scurfy on both faces becoming glossy green with raised venulation and glabrous above, but dull and somewhat scurfy and floccose in the axils beneath; veins about 10–12×2, forking but hardly looped; petiole glabrescent, 1×10 mm. Catkins: ♂, 40 mm. long, silvery-villous, rather openly flowered, the glabrous anthers little exserted; ♀, 5 mm. long, fleecy, 1- or 2-flowered at the end. Fruit annual, solitary or paired on a peduncle 2×5 mm.; cup turbinately saucer-shaped, small (10 mm. in diameter), with thin appressed blunt glabrate brown scales; acorn round-ovoid, glabrous, fully half-included.

Cordilleran region of Mexico.—A medium-sized tree, with leaves shaped as in the pear tree.

Specimens examined.—Honey Station, Puebla, at 1,900 m. (*Pringle, 10008*, Apr. 25 and Sept. 25, 1904, the types).

Quercus saltillensis n. sp.

Plates 368 and 369.

Twigs slender (2 mm.), somewhat fluted, gray-scurfy, even in the second season somewhat hoary, but grayish red with little evident lenticels. Buds reddish brown, somewhat puberulent, ovoid, 2 mm. in diameter. Leaves deciduous, lanceolate, aristately acute or when reduced elliptical and obtuse, subtruncate at base to slightly cordate, entire, somewhat crisped, small (2.5×7 cm.), glossy and glabrous above, duller and sometimes minutely puberulent beneath; veins about 10–12×2, somewhat evidently looped at some distance from the margin, the venulation somewhat raised on both faces; petiole gray-scurfy, 1×5 mm. Catkins: ♂, 50 mm. long, from loosely hairy glabrescent, loosely flowered, the glabrous ellipsoid mucronate anthers exserted; ♀, 10 mm. long, the few flowers with glossy straw-colored scales. Fruit annual; cup somewhat turbinate, small (scarcely 10 mm. in diameter), with appressed very blunt glabrescent brown scales somewhat thickened below; acorn acutely ovoid, somewhat scurfy, about half-included.

Eastern Sierra Madre region of Mexico.

Specimens examined.—Forty miles south of Saltillo, Coahuila (*Palmer, 1277*, 1880, the type, in the Gray herbarium).

Quercus carnerosana n. sp.

Plate 369.

Twigs rather slender (2–3 mm.), little fluted, at first gray scurfy-tomentose, when denuded red-brown with small but very evident brown lenticels. Buds rather dull brown with ciliate scales, ovoid, 2×3 mm. Leaves deciduous, lanceolate, aristately acute, rounded at base or slightly cordate, entire or aristately few-toothed, small (scarcely 1.5×4.5 cm.), rather glossy, glabrous above, sparingly finely scurfy-stellate beneath; veins about 6×2, looped, the ultimate reticulation little raised below; petiole scurfy, scarcely 1×5 mm., Catkins?. Fruit annual; cup rather deep, small (about 10 mm. in diameter), with thin appressed blunt ashen-puberulent scales; acorn elongated, about one-third included.

Eastern Sierra Madre region of Mexico.

Specimens examined.—Carneros Pass, Coahuila (*Pringle, 2802*, Sept. 15, 1889, the type).

CRISPIPILES.—Moderate-sized trees with slender scurfy-tomentose twigs, ovoid buds, medium-sized or rather small lanceolate entire rather short-petioled leaves pinnately impressed above and crisply stellate beneath, and biennial fruit with thin blunt appressed scales.—Central American region.

Leaves nearly sessile, round based.....*Q. cerifera.*
Leaves petioled, subtruncate at base.....*Q. crispipilis.*

Quercus cerifera n. sp.

Plate 370.

Twigs slender (2 mm.), fluted, from dingy scurfy-fleecy glabrate and reddish with scarcely evident lenticels. Buds ?. Leaves deciduous, elliptical to lanceolate, aristate, acute to obtuse, rounded at base or slightly cordate, entire, finely crisped and revolute, small (1.5–3×4–8 cm.), glossy and glabrous or slightly stellate-scurfy and finely raised-reticulate above, the sometimes slightly bullate lower surface more persistently loose-stellate; veins about 12×2, rather distinctly looped; petiole woolly, about 1×3 mm. Flowers and fruit ?.

Central American region.—A tree said to furnish vegetable wax.

Specimens examined.—Mexico. Bajucua, Chiapas (*Cook*, *116*, the type; *117*, June 15, 1906).

Quercus crispipilis n. sp.

Plate 370.

Twigs rather slender (2–3 mm.), fluted, from gray-floccose glabrescent, red or gray with rather prominent small brown lenticels. Buds dull brown, glabrous, elongated-ovoid, 2×4 mm. Leaves deciduous ?, elliptical-oblong, aristately acute, obliquely almost truncate at base, entire, narrowly revolute, moderate (2.5–3.5×7–11 cm.), slightly glossy and glabrate or sparingly finely stellate above, paler and lightly fleecy with curly stellate hairs beneath or becoming denuded and very glossy; veins about 12×2, often with fainter intermediates, branching and somewhat evidently looped at some distance from the margin; petiole floccose or subglabrate, 1×5–10 mm. Catkins ?. Fruit biennial, on peduncles about 2×5 mm., the young cups with thin appressed blunt at first hoary scales.

Central American region.

Specimens examined.—Guatemala. Uaxac Canal (*Seler*, *2667*, Aug. 23, 1896, the type in the Berlin herbarium). Mexico. Comitan, etc., Chiapas, at 1,620 m. (*Cook*, *99*, *109*, with deep cups with inrolled margin and ellipsoid acorns fully half-included); Canjób (*Goldman*, *919*).

CINNAMOMEAE.—Moderate-sized trees with slender tomentose or scurfy twigs, ovoid buds, medium-sized lanceolate entire rather short-petioled leaves minutely venulose above and felted beneath, and biennial fruit with round thin apparently glabrescent appressed scales.—Central American region.

Leaves shortly petioled.....*Q. cinnamomea.*

Quercus cinnamomea n. sp.

Plate 371.

Twigs moderate (3 mm.), somewhat fluted, brown beneath a detachable very dense fawn-colored tomentum, becoming blackish or dark gray with rather prominent small lenticels. Buds glossy brown, glabrescent, ovoid, finally 3×5 mm. Leaves deciduous, broadly lanceolate, flagellately acute, rounded at base or very slightly cordate, entire or with a few very small awned serratures, rather small (2.5–3×7–10 cm.) green, glossy and glabrous or a little scurfy in sheltered places above, detachably densely tawny-olive tomentose beneath, the denuded surface glossy and somewhat low-granular; veins about 12–15×2, at most indistinctly looped; petiole tomentose, 1.5×5–8 mm. Catkins: ♂, 50 mm. long, woolly, rather closely flowered, the glabrous ellipsoid anthers little exserted; ♀, of a single nearly sessile flower. Fruit biennial, the young cups with thin appressed very blunt glabrate and glossy brown scales.

Central American region.

Specimens examined.—Guatemala. Quiché to Totonicapan (*Cook*, *27*, May 16, 1906, the type).

GRANDES.—Large trees with rather slender glabrous twigs, ovoid buds, large cuneately lanceolate aristately low-toothed thin leaves sharply raised-reticulate above and glabrescent beneath, and moderate biennial fruit with somewhat keeled pointed appressed downy scales.—Central American region.

Petioles moderate (15–40 mm.).....*Q. grandis.*
Petioles very long (50–70 mm.).....*v. tenuipes.*

QUERCUS GRANDIS Liebmann.

Plates 372 and 373.

Quercus grandis Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 183.—Liebmann-Oersted, Chênes Amér. Trop., p. 25, pl. 4.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 65.

Twigs rather slender (2–3 mm.) fluted, glabrate, dark red or grayish black with small evident pale lenticels. Buds rather glossy brown, glabrescent or somewhat villous at top, ovoid, about 2×3–4 mm. Leaves deciduous?, oblanceolate, acute, narrowly attenuate or the larger rounded at base, rather remotely low-serrate or deltoid-toothed with the margin nearly straight between the setaceous teeth, large (5×14 to 9 or 11×23 cm.), glabrous and somewhat glossy, the lower surface somewhat paler; veins about 10×2, looped, closely raised-reticulate on the upper face; petiole glabrous, 1×10–15 mm. Catkins?. Fruit biennial, solitary or paired on a glabrous stalk about 3×10 mm.; cup tureen-shaped, slightly umbonate, large (25–30 mm. in diameter), with thin appressed or loose-margined blunt scales brown and glossy when abraded; acorn depressed, two-thirds or more included.

Central American and, in a variety, adjacent cordilleran regions.—A large tree.

Specimens examined.—Guatemala. Without locality (*v. Warscewicz, 20*—the type,*?56*; foliage of *Q. grandis*, associated with fruit of *Q. oocarpa*, occurs in the Candollean herbarium as *v. Warscewicz, no. 44;* Volcan de Fuego (*Smith, 2630*); Samac (*Smith, 1709*); Rio Negro (*Smith, 3154*); Rio Nella Pavon (*Skinner, 1*); Zacatepequez (*Rodriguez, 3636*, with the cup-scales somewhat thickened at base). Mexico. Lalana, Chinantla, Oaxaca (*Galeotti, 135–6*, with petiole slenderly elongated to 40–70 mm., var. **tenuipes**).

The specific name *grandis* has been given to forms of *Q. pedunculata* (p. 34) and *Q. lanuginosa* (p. 43) of Europe by Gandoger, Fl. Europae, vol. 21, 1890.

HUITAMALCANAE.—Moderately large trees with slender glabrous twigs, ovoid buds, and rather large sharply aristate-serrate lanceolate short-petioled finely raised-reticulate glabrescent thin leaves.—Eastern Sierra Madre and cordilleran regions of Mexico.

Leaves acute-based: teeth low.....*Q. Cortesii.*
Leaves rather round-based; teeth large.
Leaves lance-oblong; northern.....*Q. huitamalcana.*
Leaves broadly oblanceolate; southern.....*Q. chiapasensis.*

QUERCUS CORTESII Liebmann.

Plate 373.

Quercus Cortesii Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 175.—Liebmann-Oersted, Chênes Amér. Trop., p. 23, pl. C.—Oersted, Bidrag, Kundsk. Egefamil., pl. 4.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 29.

Twigs slender (2 mm.), fluted, glabrous, rather glossy blackish with evident pale lenticels. Buds straw-color, glabrescent, rounded, 2 mm. in diameter. Leaves deciduous?, narrowly lanceolate, acute at both ends, rather distantly aristate-serrate, moderate (3×12 cm.), glossy and glabrous except for some axillary tufts beneath; veins about 15×2, unequal, little looped; petiole glabrous, 1×5–10 mm. Flowers and fruit?.

Eastern Sierra Madre region of Mexico.

Specimens examined.—Hacienda de Jovo to Huitamalco (*Liebmann, 27, 3463, 28, 3464, 29, 3462*, May, 1841, the types; *26*); Monte Pacho (*?Liebmann, 3573*); Mirador (*?Liebmann; Sartorius, 1306*).

Quercus huitamalcana n. nom.

Plate 374.

Quercus Serra Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 174.—Liebmann-Oersted, Chênes Amér. Trop., p. 23, pl. B.—Oersted, Bidrag Kundsk. Egefamil., pl. 3.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 80.—Not *Q. Serra* Unger, Chloris Protogaea; and Syn. Pl. Foss. p. 216, 1845.

Twigs rather slender (2–3 mm), fluted, soon glabrate and rather glossy, blackish with small scarcely pale lenticels. Buds somewhat glossy light brown, glabrescent, ovoid, 2×3 mm. or more. Leaves deciduous?, lanceolate, acute, variously rounded or acute at base, coarsely deltoid-serrate usually throughout, irregularly crisped, narrowly revolute, large (4×16 to 6–7×20

cm.), glabrous and glossy on both faces, the upper finely raised-reticulate; veins about 15×2, somewhat angularly looped, aristately produced from the very acute teeth: petiole glabrous, 2×10 mm. Flowers and fruit?.

Cordilleran region of Mexico.

Specimens examined.—Huitamalco to Tiuzutlan, Puebla, at 2,000 m. (*Liebmann, 31, 3560,* the type; *30*).

QUERCUS CHIAPASENSIS Trelease.

Plates 375 to 377.

Quercus chiapasensis Trelease, Proc. Amer. Philos. Soc., vol. 54, p. 9, pl. 2, 1915.

Twigs moderate (3 mm.), fluted, from floccose quickly glabrescent, becoming olive-gray with finally evident small lenticels. Buds brown, hairy, ovoid, 2 mm. in diameter; or straw-colored, larger and with narrow stipules. Leaves evergreen, lanceolate, long-acute, rounded at base, coarsely serrate with long aristate teeth, large (4–8×12–15 cm.), at first very woolly, but finally green and glabrous on both sides, the paler lower surface glossier; veins about 15×2, scarcely looped; petiole glabrate, 5–10 mm. long. Catkins?. Fruit biennial?, solitary on a thick stalk scarcely 10 mm. long; cup saucer-shaped, very large (35–45 mm. in diameter), with thickened closely appressed at first woolly brown scales; acorn short-ovoid, some 30 mm. long, covered at the base only.

Central American region.—Resembling *Q. huitamalcana* in foliage, and *Q. Skinneri* in fruit.

Specimens examined.—Mexico. Finca Irlanda, Chiapas (*Purpus, 6999,* Sept. 1913, the type).

The following foliage forms of *Q. chiapasensis* occur about Tapachula. The numbers are those under which I have received specimens from Mr. E. Reeves, collected in 1918 at the Finca San Juan las Chicharras.

Petiole short (scarcely 10 mm.) and relatively stout.
- Leaves prevailingly rounded at base.
  - Teeth moderate ..... *Q. chiapasensis.*
  - Teeth long (15–30 mm.) and falcate ..... f. *falcilobata.*
- Leaves prevailingly acute at base.
  - Shortly acute at base; teeth small ..... f. *flagellata.*
  - Very long-cuneate, subsessile ..... f. *cuneifolia.*

Petiole long (15–30 mm.) and slender.
- Leaves prevailingly acute at base.
  - Cuneate for some distance ..... f. *subcuneata.*
  - Shortly acute at base ..... f. *petiolata.*
- Leaves prevailingly rounded at base ..... f. *longipes.*

Q. **chiapasensis falcilobata** (*Reeves, 5*—the type, 10); f. **flagellata** (*Reeves, 6*); f. **cuneifolia** (*Reeves, 3*); f. **subcuneata** (*Reeves, 9*); f. **petiolata** (*Reeves, 8*); f. **longipes** (*Reeves, 1*).

BRENESIEAE.—Moderately large trees with slender glabrous twigs, ovoid or conical buds, and moderate irregularly and coarsely serrate lanceolate subsessile finely raised-reticulate glabrescent firm leaves.—Central American region.

Leaves broadly lanceolate, falcately toothed ..... *Q. Brenesii.*

Quercus Brenesii n. sp.

Plate 377.

Twigs slender (2 mm.), fluted, from dingy-tomentose glabrate, reddish with more or less evident small brown lenticels. Buds glossy brown, glabrate, ovoid or the terminal elongated and 2×5–6 mm. Leaves deciduous, broadly lanceolate, acute at both ends, coarsely triangular-serrate with very acute though not setaceous teeth, the intervening margin straight, crisped, slightly revolute, moderate (3–3.5×8–12 cm.), green and glossy on both faces, glabrous or somewhat fleecy on either face toward the base; veins about 10×2, with a number of fainter intermediates, branched and looping; petiole dingy-tomentose, scarcely 3 mm. long. Catkins?. Fruit biennial?, the young cup with thin appressed blunt gray-puberulent scales.

Central American region.

Specimens examined.—COSTA RICA. S. Ramon to S. Mateo, at 600–800 m. (*Brenes, 14520*, June 21, 1901, the type).

SKINNERIAE.—Large trees with slender glabrous twigs, ovoid buds, rather ovate or lanceolate aristately toothed thin glabrate leaves sharply venulose above, and large biennial thick-walled fruit with very shallow cups with thickened more or less pointed glabrous scales.—Central American region.

Leaves ovate, very long-petioled.....*Q. Skinneri.*

QUERCUS SKINNERI Bentham.

Plate 378.

Quercus Skinneri Bentham, Gard. Chron., 1841, p. 16, with figure; Plant. Hartweg., p. 90, 1842.—Hooker, Icones Plant., vol. 5, pl. 402.—Liebmann-Oersted, Chênes Amér. Trop., pl. B, 2.—Lindley, Veg. Kingd., 2 ed., f. 201.—Engler & Prantl, Nat. Pflanzenfam., Abt. 4, Teil 3, Hälfte 1, p. 51. f. 38B.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 64.

Twigs rather slender (2–3 mm.), fluted, from floccose quickly glabrescent, gray with inconspicuous or finally prominent lenticels. Buds glossy brown, glabrescent, ovoid, 2 mm. in diameter. Leaves deciduous?, ovate, acute, inequilaterally obtuse but shortly decurrent at base, deeply serrate with long-aristate teeth, rather large (4–7×8–10 cm.), green and glabrous on both sides; veins about 7×2, scarcely looped; petiole glabrate, 1×25–35 mm. or more. Catkins: ♂, 70 mm. long, transiently fleecy, loosely flowered, the glabrous oblong mucronate anthers little exserted; ♀, about 5 mm. long, 1- or 2-flowered at the end. Fruit biennial, solitary or paired on a stalk 5–15 mm. long; cup saucer-shaped, very large (50 mm. in diameter), with thickened closely appressed brown scales; acorn short-ovoid, some 50 mm. long, thick-walled with intruded septa, covered at the base only.

Central American region extending into the Cordilleran region of Mexico?

Specimens examined.—Guatemala. About Quezaltenango (*Hartweg, 615*, the type); without locality (*v. Warscewicz, 40*); Finca Sepacuite (*Cook & Griggs, 615*).

It may be questioned whether specimens from Chinantla, Oaxaca, Mexico (*Liebmann, 18, 19, 3561*, Sept., 1842), with the mature buds dull brown and 3×6 mm., and with lance-elliptical leaves sometimes 20 cm. long, are to be referred here. Doctor Nelson informs me that he has seen the species equally in Chiapas and Guatemala, but the acorns which he has shown me may well belong to the related *Q. chiapasensis*.

ACUTIFOLIAE.—Rather large trees with slender glabrescent twigs, ovoid-fusiform buds, prevailingly lanceolate aristately toothed or incised mostly large and long-petioled thin raised-venulose leaves glabrescent, except in one species, and annual or biennial rather short-stalked medium-sized or somewhat large fruit with thin usually tomentose and appressed scales.—Mexican Sierra Madre and cordillera.

Leaves moderate, glabrate except in *Q. furfuracea*.
- Fruit annual.
  - Cups very canescent.
    - Leaves narrowly lanceolate.....*Q. Canbyi.*
    - Leaves ovate-lanceolate.
      - Rather long-pointed.....f. *ascendens.*
      - Blunt or shortly acute.....f. *Berlandieri.*
  - Cups not whitened.
    - Leaves cuneate, long-petioled, lobed.....*Q. Karwinskii.*
    - Leaves round-based, aristate from the veins.
      - Cup turbinate, small (12 mm.).....*Q. Sartorii.*
      - Cup half-round, larger (15 mm.).....f. *magna.*
- Fruit biennial.
  - Leaves scurfy beneath.....*Q. furfuracea.*
  - Leaves glabrate.
    - Petioles elongated (15–20 mm.).
      - Fruit rather small (15 mm.).
        - Leaves scarcely 12 cm. long.....*Q. Grahami.*
        - Leaves dictinctly larger.....v. *coyulana.*
      - Fruit larger (20 mm.).....v. *Nelsoni.*
    - Petioles shorter (10 mm.); toothing deep.....f. *brevipes.*

Leaves rather large, glabrescent, except in *Q. vexans*.
- Fruit annual.
  - Glabrate ..... *Q. tonaguiae.*
  - Rather persistently somewhat fleecy ..... *Q. vexans.*
- Fruit biennial.
  - Cup inrolled at margin, with rather small scales, moderately small.
    - Turbinate ..... *Q. Candolleana.*
    - Rounded at base.
      - Leaves acute.
        - Leaves lanceolate ..... *Q. conspersa.*
        - Leaves ovate; cup shallow ..... f. *ovatifolia.*
      - Leaves caudately attenuate ..... f. *caudata.*
  - Cup not inrolled, with coarse scales, rather large.
    - Western; leaves evergreen.
      - Leaves long-pointed.
        - Broadly lanceolate ..... *Q. acutifolia.*
        - Narrowly lanceolate ..... v. *angustifolia.*
      - Leaves merely acute ..... f. *abrupta.*
    - Eastern; leaves deciduous.
      - Petiole elongated (20 mm.) ..... *Q. xalapensis.*
      - Petiole short (5–10 mm.).
        - Leaves long-pointed ..... f. *jalapae.*
        - Leaves merely acute ..... f. *surculina.*

Quercus Canbyi n. sp.

Plates 379 and 380.

Twigs slender (2 mm.), fluted, quickly glabrate, glossy red with scarcely evident lenticels. Buds somewhat glossy brown, gray-ciliate, ovoid, scarcely 1.5×2 mm. Leaves deciduous, narrowly lanceolate, long attenuate, cuneate, setaceously few-toothed with deep rounded sinuses, rather small (1.5–2.5×6–9 cm.), from minutely scurfy above and short-floccose beneath becoming glossy green and quite glabrous, or with axillary tufts beneath; veins about 6–8×2, somewhat branching but hardly looped; petiole glabrous, 1×10–20 mm. Catkins: ♂, 50 mm. long, slender, lightly almost cobwebby, the glabrous ellipsoid anthers little exserted. Fruit solitary or paired, at most very short-stalked; cup umbonately cup-shaped, small (10 mm. in diameter), with thin appressed rather acute silvery scales· acorn elongated-ovoid, 12 mm. long, somewhat silvery-silky, scarcely half-included.

Eastern Sierra Madre region of Mexico.—A small tree 6–8 m. high, called encino colorado, dedicated to the memory of my late friend, Mr. W. M. Canby, in whose company I had the pleasure of collecting in its habitat.

Specimens examined.—Monterrey, N. L., at about 650 m. (*Pringle, 2393*, Aug. 29, 1889—the type, also *2096, 10155; Sargent*, 1900).

With somewhat hoary twigs, more ovate round-based leaves less pointed and with shorter teeth and shallower sinuses, and smaller fruit about 8 mm. in diameter, at a slightly greater altitude in the same region, this becomes f. **ascendens;** (*Pringle, 11705*, Aug. 20, 1903, the type; *Sargent*, 1887; *Trelease, 121; Canby, Sargent and Trelease, 224*). Sterile twigs from between Victoria and Tula (*Berlandier, 801, 2221*, Nov., 1830), scarcely to be referred elsewhere, have the thin very venose leaves either broad, 2×5 to 3.5×5–7 cm., and shallowy sinuate-dentate or errate, or elongated, 2×7 cm., and deeply sinused and with very short petioles, f. **Berlandieri.**

Quercus Karwinskii n. sp.

Plate 379.

Twigs slender (2 mm.), fluted, glabrous, with evident small pale lenticels. Buds brown, glabrous, ovoid, about 2×3 mm. Leaves deciduous, narrowly lanceolate, acute, cuneate, setaceously few-toothed, the teeth deltoid or shouldered or the lowest subhastately paired,

moderate (2–3×10–12 cm.), glossy and glabrous except for some tomentum in the axils beneath; veins about 10×2, nearly simple and little looped; petiole glabrous, filiform, 20–30 mm. long. Catkins ?. Fruit annual, sessile, solitary or paired; cup turbinate, small (10 mm. in diameter), with thin or slightly keeled appressed blunt glabrescent or somewhat gray scales; acorn (immature) subincluded.

Eastern Sierra Madre region (?) of Mexico.

Specimens examined.—Without data (*Karwinski*, the type in the Munich herbarium).

QUERCUS SARTORII Liebmann.

Plate 381.

Quercus Sartorii Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 177.—Liebmann-Oersted, Chênes Amér. Trop., p. 24, pl. B, 19.—Oersted, Bidrag Kundsk. Egefamil., pl. 3.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 30.

Twigs rather slender (2–3 mm.), little fluted, from stellate-scurfy glabrescent and blackish with small brown lenticels. Buds rather glossy brown, at length glabrescent, somewhat angularly ovoid, 3×4–6 mm. Leaves deciduous, elliptical-lanceolate, acute, typically rounded at base, entire with aristate veins or very low-serrate, moderate (2.5–5×9–13 cm.), rather glossy, glabrescent or somewhat tufted in the axils beneath; veins about 10×2, branching; petiole mostly glabrate, 1×15–30 or even 40 mm. Catkins ?. Fruit annual, solitary, paired or clustered on a peduncle 2×5–15 mm.; cup more or less turbinately hemispherical, rather small (12 mm. in diameter), with thin appressed obtuse scales from golden-puberulent glabrate and glossy; acorn round-ovoid, silky, half-included.

Eastern Sierra Madre region of Mexico.

Specimens examined.—Totutla, at 1,300 m. (*Liebmann, 11, 14, 17, 3554*, Aug., 1841, the types; *15*, Oct., 1841); Mirador (*Liebmann, 3551; ?Sartorius, 1301*); Alpatlahua (*Liebmann, 16, 3555*); Huatusco (*Purpus, 2302*); Jalapa (*Galeotti, 127*); Orizaba (*Botteri, 952*); Cordoba (*Fink, 2, 10, 11*); Cofre de Perote (*Hahn*); without locality (*?Ghiesbreght, 1, 10*).

At S. Bartolomé (*Liebmann, 12, 3552*, Oct., 1841) it occurs in a more persistently puberulent form with larger fruit, the less turbinate cup fully 15 mm. in diameter, f. **magna.**

QUERCUS FURFURACEA Liebmann.

Plate 382.

Quercus furfuracea Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 189.—Liebmann-Oersted, Chênes Amér. Trop., p. 26.

Q. acutifolia in part A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 66, 1864.

Q. acutifolia furfuracea Oersted in Liebmann-Oersted, Chênes Amér. Trop., pl. C, 12, 1869.

Twigs rather slender (2–3 mm.), fluted, persistently dingy-scurfy or glabrescent and blackish without very conspicuous lenticels. Buds glossy light brown, glabrescent, round-ovoid, 2 mm. in diameter. Leaves deciduous, elliptical or ovate to lanceolate, acute, mostly rounded at base or even slightly cordate, nearly entire to aristately low crenate-serrate, moderate (2.5–4.5×8–10 or 12 cm.), glabrous above, sparingly gray-stellate and with axillary tufts beneath; veins about 8×2, branched but hardly looped, running into the teeth or produced from the margin as awns; petiole scurfy or glabrescent, 1×2–3 or mostly 10–15 mm. Catkins ?. Fruit biennial, solitary or paired on peduncles 2×10–20 mm.; cup somewhat turbinate, rather small (12 mm. in diameter), with thin appressed blunt brown or rather golden-puberulent scales; acorn round-ovoid, more than half included.

Cordilleran region of Mexico.

Specimens examined.—Chinantla, Puebla, at 2,300–2,600 m. (*Liebmann, 191, 3438*, May, 1841, the type; *192*, Jan., 1841; *3569*, May, 1841); Sta. Maria (*Rathsack, 1109*, the fruit seemingly annual); Patzcuaro, Michoacan (*?Pringle, 5356*).

QUERCUS GRAHAMI Bentham.

Plates 383 and 384.

Quercus Grahami Bentham, Plant., Hartweg., p. 57, 1840.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 78.

Q. acutifolia Liebmann-Oersted, Chênes Amér. Trop., pl. C, 13 except f. 2-3.—Not *Q. acutifolia* Née, to which f. 2-3 pertain.

Twigs slender (2 mm.), fluted, soon glabrous, brownish with small pale lenticels. Buds rather glossy light brown, glabrescent, ovid, 2×3 mm. Leaves deciduous, lanceolate, acute or somewhat attenuate, typically rounded at base, setaceously serrate, sometimes with deep sinuses, moderate (2–4×7–12 cm.), slightly glossy, glabrous or with minute sparse scurf and axillary tufts beneath; veins about 8–10×2, little branched, not looped; petiole glabrous, 1×10–25 or even 35 mm. Catkins: ♂, 30 mm. long, gray-tomentose, rather densely flowered, the glabrous ellipsoid anthers hardly exserted; ♀, 5–25 mm. long, with 1–3 flowers toward the end. Fruit biennial, subsessile or on a stalk scarcely 25 mm. long; cup half-round, rather large (15 mm. in diameter), with thin appressed blunt brown-edged golden-puberulent scales; acorn ovoid, 15–20 mm. long, half-included.

Cordilleran region of Mexico.—A tree some 25 m. high.

Specimens examined.—Without locality (*Graham, 326*, the type at Kew, and also to be seen in the Gray herbarium). Oaxaca. Mixteca Alta (*Galeotti, 101, 109*); Cuesta de S. Juan del Estado (*Liebmann, 38, 41, 3436; Smith 948*); Salome (*Seler, 63*); Cerro de Paxtla (*Schenck, 241*); Yavesia (*Liebmann, 35, 3490, 37, 39, 40, 3435*); Cuesta de Lachopa (*Liebmann, 34, 3570*); Cuauhtlilla (*Seler, 1484*); Tecomatlan (*Seler, 1595*); about Puebla (*Arsène, 1067*).

A form with more ovate or elliptical deeply toothed leaves and petiole scarcely 10 mm. long, may be differentiated as f. **brevipes:** Puente Colorado, Cuesta de Aculcingo (*Liebmann, 33, 3437, 3439*, May, 1842); Cerro de Paxtla (*Purpus, 2759*).

A form with ovate-lanceolate very long-attenuate leaves as much as 5×15 cm., at first golden-pubescent beneath, from El Portello, Coyula, Oaxaca (*Conzatti 3553*) is var. **coyulana.**

With ovate-lanceolate long-stalked leaves, but fruit 20 mm. in diameter, it occurs from S. Miguel Albarrados (*Nelson, 533*) in a heavy-leaved form which may be called var. **Nelsoni.**

Quercus tonaguiae n. sp.

Plate 385.

Twigs rather slender (2–3 mm.), glabrescent, dull brown with minute lenticels of the same color. Buds glossy light brown, glabrous, ovoid, 2×3, becoming 3×6 mm. Leaves deciduous?, of generally elliptical outline but enormously variable, acute to obtuse or emarginate, the base from long-cuneate to truncately cordate, entire but setaceous from several of the veins, rather large (4–6×10–14 cm.), slightly glossy, glabrous above, somewhat fleecy in the axils beneath: veins about 10×2, scarcely looped; petiole somewhat stellate-hairy or glabrescent, 1×25–40 mm. Flowers and fruit?.

Cordilleran region of Mexico.—A tree 20 mm. high.

Specimens examined.—Oaxaca, Tonaguia, at 1,300 m. (*Galeotti*, without number, the type in the Berlin herbarium, referred by Martens and Galeotti, p. 224, under no. *105*, to *Q. acutifolia*).

Quercus vexans n. sp.

Plate 386.

Twigs rather slender (2–3 mm.), fluted, fleecy-scurfy often into the second year becoming more or less glossy red-brown with prominent pale lenticels. Buds rather glossy brown, glabrate below, rather long-hairy above, 2×3 mm. or more. Leaves deciduous, broadly lanceolate, long-acute, obliquely rounded to subacute at base, long-setaceous from some of the veins or distantly serrate, rather large (3–6×10–15 cm.), slightly glossy, puberulent along the midrib above, detachably stellate-fleecy or tardily glabrate in large part beneath; veins some 12×2, obscurely looped; petiole stellate-hairy, 1×20–30 mm. Catkins?. Fruit annual, mostly

paired at end of a peduncle 2–3× scarcely 10 mm.; cup half-round, rather small (scarcely 15 mm. in diameter), with thin appressed blunt brown or grayish scales, its margin little inrolled; acorn round-ovoid, slightly silky, fully half included.

Eastern Sierra Madre region of Mexico.

Specimens examined.—Huatusco (*Purpus*, Dec., 1914, the type).

Quercus Candolleana n. nom.

Plate 387.

Quercus acutifolia longifolia A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 67, 1864, as to Mexican material.

Twigs rather slender (2–3 mm.), somewhat fluted, from scurfy glabrate, dull brown with minute inconspicuous lenticels. Buds light brown, glabrescent, ovoid, finally 2–3×3–6 mm. Leaves deciduous, elliptical, or ovate-lanceolate, mostly acute, obliquely rounded to acute at base, aristate from the veins or somewhat deltoidally low-toothed, rather large (4–7×10–15 cm.), somewhat glossy, glabrous on both faces or mostly slightly scurfy and somewhat fleecy-tufted in sheltered places beneath; veins about 10×2, branched, but at most irregularly looped; petiole stellate or glabrate, 1×20–40 mm. Catkins?. Fruit biennial, 1–3 at end of a peduncle 2–3×15–35 mm.; cup rather shallowly turbinate, rather small (scarcely 15 mm. in diameter), with thin appressed blunt brown scales, its margin inrolled; acorn round-ovoid, somewhat striate and scurfy, about one-third included.

Eastern Sierra Madre region of Mexico.

Specimens examined.—Huatusco (*Ghiesbreght, 124*, 1842, the type). Though first cited under *Q. acutifolia longifolia*, and its only representative in the Candollean herbarium, this is hardly to be retained in the Central American species to which Liebmann had earlier given the name *longifolia*.

Quercus conspersa Bentham.

Plates 388 and 389.

Quercus conspersa Bentham, Plant. Hartweg., p. 92, 1842.—Liebmann-Oersted, Chênes Amér. Trop., pl. D.—Oersted, Bidrag Kundsk. Egefamil., p. 337, f.

Q. acutifolia conspersa A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 66, 1864.—Liebmann-Oersted, Chênes Amér. Trop., pl. 12, 14.

Twigs rather slender (2–3 mm.), fluted, soon glabrous, blackish with small pale lenticels. Buds red-brown, glabrescent, ovoid, 2×4 mm. Leaves deciduous, extremely variable, from narrowly to broadly lanceolate, mostly long-attenuate, rounded or acute at base, entire to usually setaceously serrate, the margin either not indented or with rounded sinuses, rather large (3–4×12–16, or even 7×18–25 cm.), rather hard and thick, glossy and glabrous on both faces or mostly somewhat tufted in the axils and often minutely tomentulose and scattered-stellate beneath; veins about 10×2, more or less branching but scarcely looped; petiole glabrous, 1.5×15–30 mm. Catkins: ♂, 50–60 mm. long, glabrate from silvery-villous, loosely flowered, the glabrous ellipsoid anthers somewhat exserted; ♀, some 5–15 mm. long, about 2-flowered near the end. Fruit biennial, on a stalk 2×15–30 mm.; cup half-round, rather small (10–15 mm. in diameter), with somewhat thick-based appressed rather obtuse canescent scales, its margin typically inrolled; acorn ovoid, more or less brown-silky, scarcely half-included.

Central American region.—A tree some 15 m. high.

Specimens examined.—Guatemala. Las Casillas Mts. (*Hartweg, 617*, the type); Rio Negro, Quiché, at 1,200 m. (*Heyde & Lux, 3154*); Sta. Rosa, at 1,300 m. (*Heyde & Lux, 3151; Heyde, 1; Cook, 247*); about San Lucas (*Trelease*, 52–53); Barrancas about Guatemala City (*?Hayes*, 1860, with short petioles); Fiscal (*Deam, 6218*); San Antonio (*Kellerman, 5028*); Cuesta de Chuacus (*Pittier, 131*); Chiquin to Trapiche Grande (*Pittier, 129*); Salamá to Rabinal (*Cook & Doyle, 282*); Rabinal (*Cook, 14*); Purulha (*Cook, 288*); Purulha to Sta. Rosa (*Cook, 278*); without locality (*v. Warscewicz, 1, 3, 5–7, 23, 27; Oersted, 3440*). Mexico. Teopisco, Chiapas (*Collins & Doyle, 118*); Los Pinos (*Goldman, 1054*).

The form with broad, short-acute, round-based leaves may be called f. **ovatifolia**—figured by Liebmann-Oersted, *l. c.*, pl. 14, f. 3: Guatemala. Without locality (*v. Warscewicz, 2, 28*, the type; *Bernouili & Cario, 1100*); Fiscal (*Deam, 6087*).

With very long-attenuate leaves more rusty-scurfy beneath, it may be differentiated as f. **caudata**: Guatemala city to Coban (*Lehmann, 1320*, Apr. 15, 1882, in the Berlin herbarium).

QUERCUS ACUTIFOLIA Née.

Plates 390 and 391.

Quercus acutifolia Née, Anal. Cienc. Nat., vol. 3, p. 267, 1801.—Liebmann-Oersted, Chênes Amér. Trop., pl. 13.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 66.

Twigs rather slender (2–3 mm.), fluted, from stellate-scurfy glabrate, reddish with small pale lenticels. Buds somewhat glossy brown, glabrate, round- or prismatic-ovoid, and then 3×6 mm. Leaves evergreen, hard-papery, ovate-lanceolate, acute or long-attenuate, mostly rounded at base or even slightly cordate, aristately serrate with concave sinuses, large (5–7×15–20 cm.), glossy and glabrous above except along the dingy-puberulent midrib, the duller lower surface more or less floccose in the axils; veins about 10×2, often with fainter ones intermediate or toward the tip, branching but hardly looped; petiole rusty stellate-tomentose, about 2×20 mm. Catkins: ♂, about 50 mm. long, rusty, at length rather loosely flowered, the glabrous ellipsoid mucronate anthers little exserted; ♀, scarcely 10 mm. long, 2- or 3-flowered at the end. Fruit biennial.

Western Sierra Madre region of Mexico; the type from the road between Acapulco and Mexico City, where it was particularly observed about the Rio Mescala.—A tree 10 m. high, called aguatle, according to Bonpland.

Specimens examined.—Acaguisocla to Mojonera (*Bonpland, 3917*, the type collection of var. *Bonplandii* A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 66, 1864, with the midrib resiniferous-granular above). Without data (*Haenke, 275*, in the herbarium of the National Museum at Prague, possibly collected in company with Née). What appears to be this species is cultivated in the Azores (*Carreiro, 6*).

With narrowly lanceolate leaves very acute at both ends and scarcely more lobed than in *Q. Sartorii*, it is var. *angustifolia* A. de Candolle in de Candolle, Prodromus, *l. c.*: Without locality (*Herb. Thibaud, 3*, supposedly from Née, in the Candollean herbarium). With merely acute leaves deltoidly few-toothed above from a little indented margin, it becomes f. **abrupta**: Road to the volcano Colima (*Ross, 534*).

QUERCUS XALAPENSIS Humboldt and Bonpland.

Plates 392 and 393.

Quercus xalapensis Humboldt & Bonpland, Plant. Aequinoct., vol. 2, p. 24, pl. 75, 1809.—Liebmann-Oersted, Chênes Amér. Trop., pl. 4.—v. Ettingshausen, Denkschr. K. Akad. Wien, vol. 15, part 1, pl. 10.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 64.

Twigs moderate (3 mm.), fluted, quickly glabrate, blackish with conspicuous small white lenticels. Buds glossy brown, glabrescent, acutely ovoid, 2–3×3–5 mm. Leaves deciduous, broadly or ovately lanceolate, acute, the base typically acute or decurrent on the petiole if rounded, setaceously serrate with shallow or nearly flat intervals, large (4–8×10–15 cm. or more), slightly glossy, glabrous or with sparing axillary tufts beneath; veins about 10×2, branched, hardly looping; petiole glabrescent, 1×20–30 mm. Catkins: ♂, 60 mm. long, glabrescent, rather loosely flowered, the glabrous ellipsoid anthers little exserted; ♀, at first scurfy, scarcely 10 mm. long, about 2-flowered at the end. Fruit biennial, solitary or paired on a stalk some 4×10 mm.; cup half-round, 20 mm. in diameter, with thin rather loose blunt hoary scales; acorn round-ovoid, pointed, about 20 mm. long, half-included, somewhat gray-silky.

Eastern Sierra Madre region of Mexico.—A tree 20–35 m. high.

Specimens examined.—Jalapa, at 1,320 m. (*Bonpland, 4467*, the type; *Pringle, 8108*); Mirador (*Sartorius, 1305; Galeotti, 18, 95* in part—though *Q. calophylla* occurs under this number

in the Delessert herbarium; *Liebmann, 3571, 3574; Ross, 589; Nelson, 91*); Huatusco (*Ghiesbreght, 11, 124*); Dos Puentes, near Totutla (*Liebmann, 3572*); Zacuapam (*Schenck, 696; Purpus,* 1912); Monte Pacho, near Jalapa (*?Liebmann, 3573*); Perote (*Hahn*); Cordoba (*?Fink, 3–4, 12–14*); Orizaba (*Mohr, 1857; Botteri, 858; Lemmon, 102*); without locality (*Karwinski; Paul, Duke of Wuertemberg,* 1830).

A form with smaller leaves with petioles scarcely 10 mm. long, from the type region (Jalapa, *Schiede, 18* p. p.) may be known as f. **jalapae;** and an equally small and short-petioled stage but with broader and less pointed leaves (without locality, *Karwinski*) may be called f. **surculina.**

ALBOCINCTAE.—Moderately large trees with slender glabrous twigs, ovoid buds, and large lanceolate aristately incised slender-petioled glabrous and glossy raised-venulose leaves.—Western Sierra Madre of Mexico.

Leaves with white veins and margin.....*Q. albocincta.*

Quercus albocincta n. sp.

Plate 394.

Twigs slender (2 mm.), fluted, glabrous, from brown approaching orange with scarcely evident lenticels. Buds rather dull, somewhat orange or brown, glabrous, ovoid, about 2×3 mm. Leaves deciduous, elliptical-lanceolate, acute, narrowly attenuate to obtuse at base, coarsely serrately toothed with bristles 5–7 mm. long, and sinuses deep but obtuse, large (5–9×10–15 cm.), glossy and glabrous or the somewhat paler lower surface exceptionally tufted in the axils; veins about 8×2, frequently branched but obscurely and very irregularly looped, white beneath like the midrib and the cartilaginous margin; petiole glabrous, pale, 1.5×20–45 mm. Flowers and fruit?.

Western Sierra Madre region of Mexico.

Specimens examined.—Without definite locality (*Seemann, 1966*); Sierra de Alamos (*Palmer, 371; Rose, Standley & Russell, 12787*, Mar. 4, 1910, the type).

COCCINEAE.—Usually trees, often of large size, with rather slender usually glabrous twigs, conical-ovoid buds, moderate or mostly large elliptical deeply aristately lobed long-petioled venulose usually glabrous leaves, and biennial subsessile moderate fruit with thin appressed often glabrous and brown scales.—Atlantic region of the United States.

Leaves gray-stellate beneath; buds persistently hairy, at least above; lobes of leaf tapering.....×*Q. Joori.*
Leaves glabrescent except for axillary tufts beneath.
  Buds glabrous, or a little hairy at tip.
    Buds dull straw- or clay-color, with lacerate scales.
      Lobes of leaf widened upwards.....*Q. Shumardii.*
      Lobes of leaf runcinate, tapering.....×*Q. Egglestoni.*
    Buds red-brown; lobes of leaf not widened upwards.
      Cup saucer-shaped.....*Q. maxima.*
      Cup rounded or turbinate.
        Leaves broadly elliptical.
          Lobes about 7.....*Q. borealis.*
          Lobes about 5.....×*Q. runcinata lata.*
        Leaves short-obovate.....*Q. borealis? Lowellii.*
        Leaves lance-oblong, or oblanceolate.
          Lobing uniform, rather deep.....×*Q. runcinata.*
          Lobing unequal.
            Northern; leaves rather thin.....×*Q. heterophylla.*
            Southern.
              Leaves firm and glossy.....×*Q. Mellichampi.*
              Leaves rather thin.....×*Q. ludoviciana.*
  Buds with glabrous but gray-ciliate scales. Southwestern.
    Leaves and twigs glabrate.
      Lobes characteristically oblong and with lateral teeth.....*Q. texana.*
      Lobes triangular, entire.....v. *chesosensis.*
    Leaves and twigs stellate-tufted.....v. *stellapila.*

Leaves glabrescent except for axillary tufts beneath—Continued.
Buds silky, becoming glabrous.
Rather large (3×5 mm.).
Scales of cup thin.....*Q. coccinea.*
Scales of cup tuberculately thickened.....v. *tuberculata.*
Small (2×4 mm.); scales of cup thin.....*Q. ellipsoidalis.*
Buds persistently more or less hairy.
Leaves sinuately or shallowly lobed.
Oblanceolate-oblong.....×*Q. Walteriana.*
Ovate or lance-oblong.....×*Q. Leana.*
Leaves rather deeply lobed.
Lobes pointed.....×*Q. Mellichampi.*
Lobes truncate or widened upwards.
Lobes widened upwards, long.....×*Q. palaeolithicola.*
Lobes not widened, short.
Buds large (3–5×6–10 mm.), lower lobes acute.....×*Q. Porteri.*
Buds smaller (scarcely 3×6 mm.); lower lobes acuminate.....×*Q. Willdenowiana.*

QUERCUS SHUMARDII Buckley.

Plate 395.

Quercus Shumardii Buckley, Proc. Acad. Philadelphia, 1860, p. 444.—Ashe, Bull. Charleston Mus., vol. 14, p. 9, 1918.—Sargent, Bot. Gazette, vol. 65, p. 424, 1918.

Q. texana Sargent, Gard. & For., vol. 7, p. 514, 1894; Silva, vol. 8, pl. 411; Manual, f. 190.—Hough, Handbook, p. 140, ff.—Deam, Rep. Ind. Bd. Forestry, vol. 11, p. 197, pl. 54.—Lewis, Trees of Texas, f. 15.—Trelease, Proc. Amer. Philos. Soc., vol. 51, pl. 11. In part.

Q. Schneckii Britton, Manual Fl. N. U. S., p. 333, 1901.—Britton & Shafer, N. A. Trees, f. 238.—Trelease, Winter Botany, p. 29, f. 2.

Southern Atlantic region of the United States, from North Carolina to Florida, west to Texas and north to Missouri and Ohio; the type of *Q. Schneckii* from Mt. Carmel, Illinois.—Schneck's red oak. See also ×*Q. Egglestoni* and *Q. Joorii.*

If, as appears to be true, the tree of this type in the Gulf States is identical with that of the valley of the Wabash, it is probable that Buckley's name *Q. Shumardii* will be accepted as pertaining to both, though Professor Sargent (Bot. Gaz., vol. 65, p. 425, 1918) segregates the form with deeper cups as var. *Schneckii.* Nothing is known of Buckley's oak originally, beyond the description ascribing it to "Upper Louisiana, eastern and middle Texas."

QUERCUS MAXIMA Ashe.

Plate 395.

Quercus maxima Ashe, Proc. Soc. Amer. Foresters, vol. 11, p. 90, 1916.

Q. rubra maxima Marshall, Arbust. Amer., p. 122, 1785.

Q. rubra Du Roi, Harbk. Baumz., vol. 2, pl. 5, 1772.—Michaux, Hist. Chênes Amér., pl. 35–6.—Michaux, f., Hist. Arb. Amér., vol. 2, pl. 26; N. A. Sylva, vol. 1, pl. 28.—Torrey, Fl. N. Y., vol. 2, pl. 106.—Emerson, Trees Mass., pl. 10.—Brendel, Trans. Ill. Agr. Soc., vol. 3, pl. 9.—Liebmann-Oersted, Chênes Amér. Trop., pl. A, B.—Vasey, Amer. Entomol. & Bot., vol. 2, p. 375, f. 225.—Houba, Chênes Amér. en Belg., p. 124, pl.—Sargent, Silva, vol. 8, pl. 409–410; Manual, f. 186.—Gray, Manual, 7 ed., f. 680.—Britton & Shafer, N. A. Trees, f. 234.—Hough, Handbook, p. 138, ff.—Emerson & Weed, Our Trees, p. 125, pl.—Pammel, Trans. Iowa Hort. Soc., vol. 51, p. 96, 2 pl.—Clements *et al.*, Minn. Trees & Shr., p. 259, f.—MacDougal, Bot. Gaz., vol. 43, f p. 49, f. 1.—Deam, Rep. Ind. Bd. Forestry, vol. 11, p. 193, pl. 52.—Otis, Mich. Trees, p. 108, f.—Burns & Otis, Trees of Vermont, p. 125, pl.—Trelease, Proc. Amer. Philos. Soc., vol. 51, pl. 11; Winter Botany, p. 29, f. 7.—Rowlee & Nichols, Bot. Gaz., vol. 20, p. 355, f. 6.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 60.—Not *Q. rubra* L. 1753.

Q. borealis maxima Ashe, *l. c.*, 1916.

?*Q. acerifolia* Petzold & Kirchner, Arbor. Muscav. p. 656, 1864.

Atlantic region of Canada and the United States, from Nova Scotia to Florida, Mississippi, Kansas and Minnesota; Marshall's type locality no doubt Pennsylvania. Fossil in Pleistocene deposits.—The red oak.

Though a change in name is destined to work endless confusion in earlier references to this common red oak of the north, which has come to be known everywhere as *Quercus rubra,*

Professor Sargent has pointed out (Rhodora. vol. 17, p. 39, 1915) that the Linnean diagnosis of *Q. rubra* is based on Clayton's specimen and illustrations of the species currently called *Q. digitata* or *falcata*. Under the prevailing rules of nomenclature the name here used has been adopted correctly by Mr. Ashe unless *Q. acerifolia* were to be demonstrably applicable.

The following hybrids of *Q. maxima* have been reported: ×*Q. Benderi* Baenitz, Allgem. Bot. Zeit., vol. 9, p. 85, 1903, with *Q. coccinea;* ×*Q. Richteri* Baenitz, *l. c.*, with *Q. palustris;* ×*Q. Porteri* Trelease, Proc. Amer. Philos. Soc., vol. 56, p. 51, 1917 (*Q. rubra*×*velutina* Sargent, Silva, vol. 8, p. 126), with *Q. velutina;* ×*Q. heterophylla* Michaux, f., Hist. Arb. Amér., vol. 2, p. 87, pl. 16, 1812.—Gale, Proc. Nat. Inst., 1855, p. 70, f. 1.—Liebmann-Oersted, Chênes Amér. Trop. pl. B.—Houba, Chênes Amér. en Belg., p. 224, pl.—Sargent, Silva, vol. 8, pl. 436; Manual, p. 248, f. 201.—MacDougal, Bot. Gaz., vol. 43, p. 49, f. f. (*Q. palustris heterophylla* Cockerell, Nature, vol. 66, p. 631, 1902.—×*Q. Hollickii* Schneider, Handb., vol. 1, p. 165, 1904); ×*Q. Hawkinsi* Sudworth, Amer. Forestry, vol. 23, p. 683, 1917 (as "*Q. borealis*" ×*velutina*); and ×*Q. runcinata* Engelmann in Gray, Manual, 5 ed., p. 454, 1868 (*Q. rubra runcinata* A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 60, 1864), which, though taken for a possible cross of *imbricaria* with the Spanish oak—which does not grow about St. Louis, is apparently of the parentage here suggested.—See also × *Q. Fernaldi.*

QUERCUS BOREALIS Michaux, f.

Quercus borealis Michaux, f., N. A. Sylva, vol. 1, p. 98, 1817.—Britton & Shafer, N. A. Trees, f. 242.
Q. ambigua Michaux, f., Hist. Arb. Amér., vol. 2, p. 120, pl. 24, 1812; N. A. Sylva, vol. 1, pl. 26.—Loudon, Arbor. Brit., vol. 3, f. 1479.—Not *Q. ambigua* Humboldt & Bonpland, Pl. Aequin., vol. 2, p. 51, pl. 93, 1809.
?*Q. angulizans* Rafinesque, Alsog. Amer., p. 22, 1838.
Q. coccinea ambigua Gray, Manual, 5 ed., p. 454, 1867.
Q. rubra ambigua Fernald in Gray, Manual, 7 ed., p. 341, 1908.

Northeastern Atlantic region of Canada and the United States, from Nova Scotia toVirginia or perhaps North Carolina, in the mountains; the type from the St. Lawrence river below Quebec.—The gray oak.

The name *borealis* has been applied specifically to a segregate of the European *Q. sessiliflora* by Gandoger, Fl. Europae, vol. 21, p. 36, 1890.

A glabrous starveling form of this or *Q. maxima*, with crisped coarsely toothed rather than lobed obovate leaves little longer than broad has been taken for a cross between *borealis* and *ilicifolia* and published without description under the name ×*Q. Lowellii* by Sargent, Bot. Gaz., vol. 65, p. 459, 1918; but bears no evident trace of *ilicifolia* parentage.

QUERCUS TEXANA Buckley.

Plate 396.

Quercus texana Buckley, Proc. Acad. Philadelphia, 1860, p. 444.—Britton & Shafer, N. A. Trees, f. 244.
Q. coccinea microcarpa Torrey, Rep. U. S. & Mex. Bound. Surv., vol. 2, p. 206,1859.
Q. rubra texana Buckley, Proc. Acad. Philadelphia, 1881, p. 123.
Q. palustris as to writers on the flora of Texas, *fide* Buckley, Proc. Acad. Philadelphia, 1881, p. 123.
Q. Shumardii texana Ashe, Bull. Charleston Mus., vol. 14, p. 9, 1918.

Southwestern Atlantic region of the United States in Texas; the type apparently from Austin, Texas.—The red oak of the southwest.

Two varieties have been differentiated by Professor Sargent in the Botanical Gazette, vol. 65, 1918.—var. *stellapila* with foliage of the eastern Texan type, but, like the twigs, stellately hairy (p. 424); and var. *chesosensis* of western Texas, with more triangular and entire leaf-lobes (p. 423). The synonym *Q. coccinea microcarpa* pertains to this western form.

The name ×*Q. Hastingsii* is proposed by Sargent, *l. c.*, p. 450, 1918, for what is held to be a hybrid between *texana* and *marilandica*, though in the herbarium it appears scarcely more than a foliage form of the polymorphic *texana*.

QUERCUS COCCINEA Muenchhausen.

Plate 396.

Quercus coccinea Muenchhausen, Hausvater, vol. 5, p. 254, 1770.—Wangenheim, Nordamer. Holz., pl. 4.—Michaux, Hist. Chênes Amér., pl. 31–2.—Michaux, f., Hist. Arb. Amér., vol. 2, pl. 23; N. A. Sylva, vol. 1, pl. 25.—Loudon, Arbor. Brit., vol. 3, f. 1746–8.—Emerson, Trees of Mass., pl. 9.—Liebmann-Oersted, Chênes Amér. Trop., pl. B.—Houba, Chênes Amér. en Belg., p. 203, pl.—Lauche, Deutsche Dendrol., p. 299, f. 120.—Dippel, Handb. Laubholzk., vol. 2, f. 56.—Sargent, Silva, vol. 8, pl. 412–413; Manual, f. 191.—Gray, Manual, 7 ed., f. 342.—Hough, Handbook, p. 146, ff.—Britton & Shafer, N. A. Trees, f. 245.—Emerson & Weed, Our Trees, p. 129, pl.—Deam, Rep. Ind. Bd. Forestry, vol. 11, p. 199, pl. 55.—Otis, Mich. Trees, p. 112, f.—Rowlee & Nichols, Bot. Gaz., vol. 29, p. 355, f. 7.—Trelease, Proc. Amer. Philos. Soc., vol. 51, pl. 11; Winter Botany, p. 29, f. 8.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 61, in part.

Q. acuta Rafinesque, Alsographia Americana, p. 22, 1838.

Q. coccinea Rugelii A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 62, 1864.

?*Q. coccinea vulgaris* Vasey, Amer. Entomol. & Bot., vol. 2, p. 344, f. 212, 1870.

Northeastern Atlantic region of the United States from Massachusetts to Alabama, Missouri, Tennessee, Southern Illinois, Indiana, and New Jersey; the type cultivated in Germany.—The scarlet oak.

A southern form, with large fruit and thick-based cup-scales, is var. *tuberculata* Sargent Bot. Gaz., vol. 65, p. 426, 1918.

A cross of *coccinea* with *maxima* is ×*Q. Benderi* Baenitz, Allgem. Bot. Zeit., vol. 9, p. 85, 1903, who differentiates its extremes into *coccinoides* with a f. *volvato-annulata*, and *rubrioides*. A cross with *ilicifolia* is ×*Q. Robbinsii* Trelease, Proc. Amer. Philos. Soc., vol. 56, p. 48, 1917.

QUERCUS ELLIPSOIDALIS Hill.

Plate 396.

Quercus ellipsoidalis Hill, Bot. Gaz., vol. 27, p. 204, pl. 2–3, 1899.—Sargent, Manual, f. 189.—Gray, Manual, 7 ed., f. 683.—Hough, Handbook, p. 144, ff.—Britton & Shafer, N. A. Trees, f. 243.—Clements *et al.*, Minn. Trees & Shr., p. 261, f.—Deam, Rep. Ind. Bd. Forestry, vol. 11, pl. 56.—Otis, Mich. Trees, p. 115, f.—Trelease, Proc. Amer. Philos. Soc., vol. 51, pl. 11; Winter Botany, p. 29, f. 9; Trans. Illinois Acad. Sci., vol. 12, pl. 139–143.

Q. coccinea microcarpa Vasey, Amer. Ent. & Bot., vol. 2, p. 345, 1870, f. 213 (without description), 1870.—Not *Q. coccinea microcarpa* Torrey, 1858.

Q. coccinea Sargent, Silva, vol. 8, pl. 413, f. 2 only.

North-central Atlantic region of the United States, chiefly west of Lake Michigan; the type from near Chicago, Illinois.—The jack oak.

Extreme forms, those based on the fruit passing into one another, may be differentiated as follows:

Foliage moderately lobed, as in *coccinea*.
- Cup not greatly dilated.
  - Acorn distinctly elongated, in the ratio of 2:3.
    - Cup not inrolled about the acorn.....*Q. ellipsoidalis.*
    - Cup inrolled about the acorn.....f. *incurva.*
  - Acorn broadly ovoid, in the ratio of 3:4.....f. *intermedia.*
  - Acorn nearly globose.....f. *depressa.*
- Cup much broader than the acorn, abruptly constricted to a short rim about it.....f. *coronata.*

Foliage deeply dissected into about 4 pairs of narrow lobes.....f. *heterophylla.*

These forms, except for the second and the last, were differentiated by Vasey in 1870 as forms of *Q. coccinea*, his *microcarpa* being exactly what is taken now for typical *ellipsoidalis*, and the names *intermedia*, *depressa*, and *coronata* being applied as they are here. What is called f. **incurva** was collected by Shimek in Iowa, and f. **heterophylla** in Wisconsin by Miss Ruth Marshall.

A hybrid of *ellipsoidalis* with *velutina* is ×*Q. palaeolithicola* Trelease, Proc. Amer. Philos. Soc., vol. 56, p. 50, pl. 1, 1917.

ILICIFOLIAE.—Shrubs, with rather slender tomentulose twigs, glabrate buds, moderate elliptical aristately lobed venulose leaves tomentose beneath, and biennial subsessile moderate fruit with thin appressed more or less tomentose scales.—Atlantic region of the United States.

Leaves persistently canescent beneath.....*Q. ilicifolia.*
Leaves finally glabrate.
Lobes acutely triangular.....×*Q. Fernaldi.*
Lobes often toothed or dilated above.....×*Q. Rehderi.*

QUERCUS ILICIFOLIA Wangenheim.

Plate 397.

Quercus ilicifolia Wangenheim, Beytr. Nordamer. Holz., p. 79, pl. 6, 1787.—Guimpel, Otto & Hayne, Abbild Holz., pl. 54.—Liebmann-Oersted, Chênes Amér. Trop., pl. D.—Emerson, Trees Mass., pl. 11.—Lauche, Deutsche Dendrol., p. 297, f. 121.—Houba, Chênes Amér. en Belg., p. 262, pl. .—Gray, Manual, 7 ed., f. 686.—Britton & Shafer, N. A. Trees, f. 249.—Trelease, Winter Botany, p. 29, f. 4.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 59.

Q. nigra pumila Marshall, Arbust. Amer., p. 122, 1785.

Q. rubra nana Marshall, Arbust. Amer., p. 123, 1785.

Q. Banisteri Michaux, Hist. Chênes Amér., pl. 27, 1801.—Michaux, f., Hist. Arb. Amér., vol. 2, pl. 19; N. A. Sylva, vol. 1, pl. 21.—Nouveau Duhamel, vol. 7, pl. 50.

Q. discolor Banisteri Spach, Hist. Vég., vol. 11, p. 164, 1842.

Q. nigra ilicifolia Kuntze, Rev. Gen. Pl., part 2, p. 642, 1891.

Q. nana Sargent, Gard. & For., vol. 8, p. 93, 1895; Silva, vol. 8, pl. 424; Manual, f. 195.—Emerson & Weed, Our Trees, p. 133, pl. .—Trelease, Proc. Amer. Philos. Soc., vol. 51, pl. 11.

Q. pumila Sudworth, Bull. U. S. Dep. Agr., Div. Forestry, no. 14, p. 172. 1898.

Eastern Atlantic region of the United States, from New Hampshire to South Carolina and West Virginia, chiefly in the mountains; the prototype from Pennsylvania; the type of *Q. Banisteri* from Virginia.—The bear oak or barren oak.

The name was spelled *illicifolia* by Wangeheim, but has been corrected by subsequent writers to the form here used.

The species is said to hybridize with *Q. coccinea* (Robbins in Gray, Manual, 5 ed., p. 454.—Rehder, Rhodora, vol. 3, p. 139, pl. 24, 1901.—×*Q. Robbinsii* Trelease, Proc. Am. Philos. Soc., vol. 56, p. 49, 1917); with *Q. marilandica* (×*Q. Brittoni* Davis, Bull. Torr. Bot. Club, vol. 19, p. 301, 1892); with *Q. velutina* (Rehder, *l. c.*, p. 138, pl. 24, 1901.—×*Q. Rehderi* Trelease, *l. c.*, p. 49, 1917); and with *Q. Phellos* (Peters, Bull. Torr. Bot. Cl., vol. 20, p. 295.—×*Q. Giffordi* Trelease, *l. c.*, 1917). A very questionable hybrid with *borealis* is ×*Q. Lowellii* Sargent, Bot. Gaz., vol. 65, p. 59, 1918.—See also ×*Q. Fernaldi.*

VELUTINAE.—Rough-barked trees, typically of large size, with moderate more or less pubescent twigs, large conical or 5-grooved dingy-hairy buds, generally large subelliptical and aristately lobed long-petioled venulose leaves more or less persistently pubescent beneath, and biennial subsessile or short-stalked moderate fruit with thin loose mostly tomentulose scales.—Atlantic region of the United States.

Buds large (4–5×6–10 mm.), typically 5-sided or grooved.
Leaves lobed.
Sinuses reaching halfway to the midrib.
Lobes about as wide as sinuses.....*Q. velutina.*
Lobes narrow, much toothed.....f. *dilaniata.*
Lobes narrow, subentire.....f. *pagodaeformis.*
Lobes much wider than sinuses.
Outline subelliptical.
Cup-scales loose.....f. *macrophylla.*
Cup-scales appressed.....×*Q. palaeolithicola.*
Outline elongated-obovate.....×*Q. Porteri.*
Sinuses scarcely reaching one-third to midrib.
Lobes triangular, subentire.....*Q. velutina acuta.*
Lobes truncate, or acute-angled.
Twigs persistently hairy.....f. *missouriensis.*
Twigs glabrescent.
Lobes about 5.....f. *magnifica.*
Lobes about 3.....f. *nobilis.*
Leaves sinuate or shallowly lobed.
Leaves shortly obovate.
Lobes truncate.....f. *angulosa.*
Lobes rounded.....f. *obovata.*
Leaves elliptical-obovate.....f. *sinuosa.*

Buds smaller, scarcely angled.
Leaves with dilated much-toothed lobes ..... ×*Q. palaeolithicola.*
Leaves shallowly lobed.
Lobes about 3, apical ..... ×*Q. tridentata.*
Lobes about 5, entire ..... ×*Q. Leana.*
Lobes 7–9, often toothed ..... ×*Q. Willdenowiana.*
Leaves sinuate rather than lobed.
Leaves and often lobes acute ..... ×*Q. Walteriana.*
Leaves and lobes blunt ..... ×*Q. Smallii.*

QUERCUS VELUTINA Lamarck.

Plates 4, 398, and 399.

Quercus velutina Lamarck, Encyl., vol. 1, p. 721, 1783.—Sargent, Silva, vol. 8, pl. 414–5; Manual, f. 192.—Gray, Manual, 7 ed., f. 684.—Hough, Handbook, p. 148, ff.—Britton & Shafer, N. A. Trees, f. 240–241.—Emerson & Weed, Our Trees, p. 130, pl.—Trelease, Proc. Amer. Philos. Soc., vol. 51, pl. 10; Winter Botany, p. 29, f. 3.—Clements *et al.*, Minn. Trees & Shr., p. 259.—Pammel, Trans. Iowa. Hort. Soc., vol. 51, p. 96, 2 pl.—Deam, Rep. Ind. Bd. Forestry, vol. 11, p. 203, pl. 57.—Otis, Mich. Trees, p. 116, f.—Burns & Otis, Trees of Vermont, p. 127, f.—Lewis, Trees of Texas, f. 16.—Rowlee & Nichols, Bot. Gaz., vol. 29, p. 356, f. 8.

Q. nigra Du Roi, Harbk. Baumz., vol. 2, p. 272, pl. 6, 1772.—Wangenheim, Beytr. Nordamer. Holz., pl. 6.

Q. discolor Aiton, Hort. Kew., vol. 3, p. 358, 1789.—Smith & Abbot, Insects Ga., vol. 2, pl. 56.

Q. tinctoria Bartram, Travels, p. 37, 1791 (name only).—Michaux, Hist. Chênes Amér., pl. 24–5, 1801.—Michaux, f., Hist. Arb. Amér., vol. 2, pl. 22; N. A. Sylva, vol. 1, pl. 24.—Nouveau Duhamel, vol. 7, pl. 47.—Audubon, Birds, pl. 82.—Emerson, Trees Mass., pl. 7–8.—Morren, Belg. Hort., vol. 3, pl. 54.—Brendel, Trans. Ill. Agr. Soc., vol. 3, pl. 8.—Oersted, Vidensk. Meddel. Naturh. Foren. Kjöbenhavn, 1866, p. 45, 72, f. 18.—Liebmann-Oersted, Chênes Amér. Trop., p. 9, f. 6.—Houba, Chênes Amér. en Belg., p. 187, pl.—Dippel, Handbuch, vol. 2, p. 120, f. 57.

Q. coccinea nigrescens A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 61, 1864.

Q. coccinea tinctoria A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 61, 1864.—Vasey, Amer. Entomol. & Bot., vol. 2, p. 344, f. 211.

Q. tinctoria pseudoxalapensis von Ettingshausen & Krašan, Denkschr. K. Akad. Wien, Math.-naturw. Cl., vol. 56, —pl. 13, 1889.

Throughout the Atlantic region of the United States, from Vermont to Georgia, Texas and Iowa; the Lamarckian type cultivated in Europe. Fossil in Pleistocene deposits.—The black oak or quercitron.

Varying into many foliage forms of which the less-lobed is f. **angulosa** (*Q. tinctoria angulosa* Michaux, Fl. Bor.—Amer., vol. 2, p. 198, 1803.—Loudon, Arbor. Brit., vol. 3, f. 1753–4). A form with even the twigs persistently rusty pubescent is var. *missouriensis* Sargent, Manual, p. 239, 1908 (*Q. missouriensis* Ashe, Bull. Charleston Mus., vol. 13, p. 28., 1917).

The many foliage forms which have led to confusions and misapprehensions in regard to the black oak, though sometimes associated on a single tree—as when the scarcely lobed types of suckers and young trees occur on the lower branches of a large tree which produces the most laciniate type of foliage in its crown—so often occur separated as to have caused them to receive differential names in European gardens.

So far as I can understand the publications on *velutina* and its synonyms in a broad sense, the name was applied by Lamarck to a young tree with foliage nearly of the type here segregated as f. **angulosa** (*Q. tinctoria angulosa* Michaux, Fl. Bor.-Amer., vol. 2, p. 198, 1803.—Loudon, Arbor. Brit., vol. 3, f. 1753–4), not very different except in angular and not rounded short lobes from what is here called f. **obovata**, which the elder Michaux figured as representative of *Q. tinctoria* (Hist. Chênes Amér., pl. 24), though the younger Michaux (Sylva, vol. 1, pl. 24) pictured as typical of the species the moderately lobed form which is commonest on mature trees. The only other definitely applicable published names appear to be f. **macrophylla** (*Q. tinctoria macrophylla* Dippel, Handb., vol. 2, p. 123, f. 59, 1892); f. *missouriensis* (Sargent, Manual, p. 239, 1908); f. **magnifica** (*Q. tinctoria magnifica* Dippel, *l. c.*, f. 58); f. **nobilis** (*Q. tinctoria nobilis* Dippel, *l. c.*, f. 60); and f. **sinuosa** (*Q. tinctoria sinuosa* Michaux, Hist. Chênes Amér., pl. 25).

The following hybrids are ascribed to *Q. velutina* as one parent: ×*Q. dubia* Ashe, Journ. Elisha Mitchell Sci. Soc., vol. 11, p. 93, 1894, with *Q. Phellos;* ×*Q. Leana* Nuttall, Sylva, vol. 1, p. 13*, pl. 5 bis, 1842 (Sargent, Silva, vol. 8, pl. 434.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 62), with *Q. imbricaria;* ×*Q. palaeolithicola* Trelease, Proc. Amer. Philos. Soc.,

vol. 56, p. 50, pl. 1, 1917, with *Q. ellipsoidalis;* ×*Q. podophylla* Trelease, *l. c.*, p. 51 (×*Q. petiolaris* Ashe, Journ. Elisha Mitchell Sci. Soc., vol. 11, p. 90, 1894,—not *Q. petiolaris* Bentham), with *Q. cinerea;* ×*Q. Porteri* Trelease, *l. c.*, p. 51, with *Q. maxima;* ×*Q. Rehderi* Trelease, *l. c.*, p. 51, with *Q. ilicifolia;* ×*Q. Willdenowiana* Zabel, H. D. D. G., p. 67, 1903 (×*Q. Sudworthi* Trelease, *l. c.*, p. 52), with *Q. rubra;* ×*Q. Bushii* Sargent, Bot. Gaz., vol. 65, p. 453, 1918, with *Q. marilandica;* ×*Q. Cocksii* Sargent, *l. c.*, p. 458, 1918, with *Q.* [*laurifolia*] *rhombica;* and ×*Q. Hawkinsi* Sudworth, Amer. Forestry, vol. 23, p. 683, 1917, with *Q.* "*borealis*" [*maxima*].

MARILANDICAE. Rough-barked rather small trees with more or less pubescent twigs, large fusiform brown-hairy buds, elliptical-obovate rather large and short-petioled venulose leaves, and biennial subsessile moderate fruit with thin appressed rather creamy-tomentulose scales.—Atlantic region of the United States, chiefly southward.

Leaves persistently loosely stellate beneath.
- Oblong or slightly widened upwards with about 3 short apical lobes ..... ×*Q. tridentata.*
- Subspatutately enlarged, or elongated- or cuneate-obovate, often yellow beneath.
  - Sinuately truncate or shallowly and crenately 3-lobed at apex ..... *Q. marilandica.*
  - Quite entire ..... f. *integrifolia.*
  - With 3 distinct apical lobes.
    - Lobes rounded ..... f. *aequilobata.*
    - Lobes often with a lateral tooth.
      - Rounded ..... f. *paucidentata.*
      - Very acute, often 5 ..... f. *incisa.*
    - Lobes acutely or truncately or retusely angled ..... f. *truncata.*
  - Sublyrately 5- or 7-lobed, large ..... f. *sublyrata.*
- Obovate.
  - Essentially unlobed ..... f. *subtypica.*
  - Three-lobed at apex ..... f. *cuneata.*
  - Sinuately 3- or 5-lobed ..... f. *obovata.*
  - With 3 or 5 rounded lobes, rather small ..... f. *subquinqueloba.*
  - With 3 or 5 subtruncate lobes.
    - Pubescence yellow or brown ..... f. *quinqueloba.*
    - Pubescence dingy gray ..... ×*Q. Brittoni.*

Leaves subglabrescent, shaped as in the last ..... ×*Q. Bushii.*
Leaves loosely canescent beneath, lance-oblong, irregularly sharp-lobed ..... ×*Q. Ashei.*
Leaves sparingly scurfy beneath, unequally and irregularly lobed to entire and narrow ..... ×*Q. ludoviciana.*
Leaves glabrescent.
- Cup not inrolled.
  - Leaves narrowly lanceolate and entire to broadly lanceolate, or cuneate-obovate with unequal entire lobes. ×*Q. Mellichampi.*
  - Elliptical-oblong and entire to obovate with 3 obtuse apical lobes ..... ×*Q. Rudkini.*
  - Sinuately oblong to enlarged and somewhat acutely lobed upwards ..... ×*Q. Walteriana.*
- Cup inrolled.
  - Leaves broadly elliptical to obovate.
    - Lobed along the sides.
      - Lobes broad ..... *Q. laevis.*
      - Lobes very narrow ..... f. *linearioba.*
    - Shortly 3-lobed at apex ..... f. *Rappii.*

QUERCUS MARILANDICA Muenchhausen.

Plates 400 to 403.

Quercus marilandica Muenchhausen, Hausvater, vol. 5, p. 253, 1770.—Du Roi, Harbk. Baumz., vol. 2, pl. 6.—Sargent, Silva, vol. 8, pl. 426–7; Manual, f. 198.—Gray, Manual, 7 ed, f. 688.—Hough, Handbook, p. 154, ff.—Britton & Shafer, N. A. Trees, f. 250.—Deam, Rep. Ind. Bd. Forestry, vol. 11, p. 210, pl. 60.—Otis, Mich. Trees, p. 118, f.—Pammel, Trans. Iowa Hort. Soc., vol. 51, p. 96, pl.—Trelease, Proc. Amer. Phil. Soc., vol. 51, pl. 10.—The name is sometimes spelled *marylandica* by writers later than its author.

Q. nigra Linnaeus, Sp. Pl., vol. 2, p. 996, 1753.—Wangenheim, Nordamer. Holz., p. 133, pl. 5, 1781; Beytr., p. 79, pl. 6.—Smith & Abbot, Insects of Ga., vol. 2, pl. 58.—Audubon, Birds, pl. 16.—Michaux, Hist. Chênes Amér., pl. 22–3.—Brendel, Trans. Ill. Agr. Soc., vol. 3, pl. 7.—Liebmann-Oersted, Chênes Amér. Trop., pl. A.—Vasey, Amer. Entomol. & Bot., vol. 2, p. 313, f. 198.—Houba, Chênes Amér. en Belg., p. 251, pl.—Lewis, Trees of Texas, f. 18.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 63.

Q. ferruginea Michaux, f., Hist. Arb. Amér., vol. 2, p. 92, pl. 18, 1812; N. A. Sylva, vol. 1, pl. 20.—Dippel, Handb. Laubholzk., vol. 2, p. 110, f. 51.

Q. dilatata Rafinesque, Alsogr. Amer., p. 24, 1838.

? *Q. nobilis* Masters, Gard. Chron., 1875, vol. 2, p. 816.

Atlantic region of the United States, especially in the south and west, from New York to Florida, Texas, and Kansas; the Catesby prototype of *Q. nigra* from the Carolinas; probably Fossil in Pleistocene deposits.—The black jack.

The segregated forms hardly have a placeable synonymy except for f. **integrifolia**, which is *Q. nigra integrifolia* Marshall, Arbust. Amer., p. 121, 1785; f. **cuneata**, which I take to be correctly placed under this species rather than under the turkey oak, and which is *Q. cuneata* Wangenheim, Beytr. Nordamer Holz., p. 78, pl. 5, 1787; and f. **quinqueloba**, which is *Q. nigra quinqueloba* A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 64, 1864 (*Q. quinqueloba* Engelmann, Trans. Acad. St. Louis, vol. 3, p. 542, 1876).

In the Journal of Forestry, vol. 20, no. 2, Feb. 1922, Mr. Sudworth characterizes as *Q. marilandica Ashei* the small-leaved form in which this species occurs through the plateau region of middle Texas.

The name *ferruginea*, one of the synonyms of this species, has been applied specifically to a segregate of the European *Q. pedunculata* by de Morogues, Mém. Soc. Agric. d'Orleans, vol. 50, p. 55, pl. 2, 1877.

The following hybrids of *marilandica* are reported: ×*Q. Brittoni* Davis, Bull. Torr. Bot. Cl., vol. 19, p. 301, etc., 1892; Rehder, Rhodora, vol. 3, pl. 24, with *Q. ilicifolia;* ×*Q. carolinensis* Trelease, Proc. Amer. Philos. Soc., vol. 56, p. 48, 1917, with *Q. cinerea;* ×*Q. Rudkini* Britton, Bull. Torr. Bot. Cl., vol. 9, p. 13, ff. and pl. 10–12, 1882; Mac Dougal, Bot. Gaz., vol. 43, p. 50, f. 4, with *Q. Phellos;* ×*Q. Smallii* Trelease, *l.c.*, p. 51, with *Q. georgiana* (Small, Bull. Torr. Bot. Cl., vol. 22, pl. 233); ×*Q. arkansana* Sargent, Trees and Shrubs, vol. 2, p. 121, pl. 152, 1911. *Quercus* sp. Harper, Bull. Torrey Bot. Cl., vol. 41, p. 214, f. 3 (×*Q. sterilis* Trelease, *l.c.*, p. 51). with *Q. nigra;* ×*Q. tridentata* Engelmann, Trans. Acad. St. Louis, vol. 3, p. 539, 1877, as synonym under *Q. nigra tridentata* A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 64, 1864 (figured by Britton & Brown, Ill., Fl., vol. 1, p. 520.—Sargent, Silva, vol. 8, pl. 433), with *Q. imbricaria;* and ×*Q. Bushii* Sargent, Bot. Gaz., vol. 65, p. 453, 1918, with *Q. velutina.* What seems to be scarcely more than a blunt-lobed form of *Q. texana* has been taken by Professor Sargent for a cross of that species with *marilandica* and named ×*Q. Hastingsii* (Bot. Gaz., vol. 65, p. 450, 1918).

QUERCUS LAEVIS Walter.

Plates 404 and 405.

Quercus laevis Walter, Fl. Carolin., p. 234, 1788.—Trelease, Winter Botany, p. 29, f. 1.
? *Q. flammula* Bartram, Voyage, p. 228, 344, 359, 1791. Name only.
Q. Catesbaei Michaux, Hist. Chênes Amér., pl. 29–30, 1801.—Smith & Abbot, Insects Ga., vol. 1, pl. 14.—Michaux, f., Hist. Arb. Amér., vol. 2, pl. 20; N. A. Sylva, vol. 1, pl. 22.—Loudon, Arb. Brit., vol. 3, f. 1762–3.—Houba, Chênes Amér. en Belg., p. 296, pl.—Dippel, Handbuch, vol. 2, p. 114, f. 54.—Sargent, Silva, vol. 8, pl. 417; Manual, f. 194.—Britton & Shafer, N. A. Trees, f. 239.—Trelease, Proc. Amer. Phil. Soc., vol. 51, pl. 10.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 59.

Southeastern Atlantic region of the United States, from Virginia to Florida in the coastwise States; the type from the Carolinas.—The turkey oak, or forked-leaf oak.

With leaves of the usual type but the lobes and middle very narrow, it is f. **lineariloba** (Florida, *Nash, 1645*); and with cuneately obovate leaves sharply 3-lobed at top or the larger middle lobe again 3- or 5-lobed, it is f. **Rappii** (Florida, *Rapp*, 1916), which possibly is really a form of the hybrid called ×*Q. Mellichampi.*

Four hybrids have been noted: ×*Q. Ashei* Trelease, Proc. Amer. Philos. Soc., vol. 56, p. 48, 1917 (figured by Small, Bull. Torr. Bot. Cl., vol. 22, pl. 234–5), with *Q. cinerea;* ×*Q. blufftonensis* Trelease, *l. c.*, with *Q. rubra;* ×*Q. Mellichampi* Trelease, *l. c.*, p. 50 (figured by Sargent, Silva, vol. 8, pl. 419), with *Q. laurifolia;* and ×*Q. Walteriana* Ashe, Proc. Soc. Amer. Foresters, vol. 11, p. 89, 1916 (figured by Sargent, Silva, vol. 8, pl. 418, under the name *Q. sinuata* Walter, which, following Engelmann, de Candolle and later writers have applied to this hybrid, though Mr. Ashe recently has thought to connect it definitely with the green-leaved form of *Q. Durandii*), with *Q. nigra.*

PAGODAEFOLIAE.—Large trees with glabrescent twigs, moderate finally conical or fusiform glabrescent red buds, elliptical or ovate or obovate or oblong rather large and long-petioled lobed venulose leaves, and biennial subsessile moderate fruit with thin appressed tomentulose scales. Southern Atlantic region of the United States.

Leaves tomentulose beneath.
  Pubescence creamy.
    Leaves lobed.
      Lobes triangular, nearly or quite entire.
        Moderate: leaves rather ovate ..... *Q. rubra.*
        Long, narrow, and outcurving; leaves elliptical ..... f. *falcata.*
      Lobes short and broad, toothed.
        Leaves widened upwards.
          Lobes subapical, mostly 3 ..... f. *triloba.*
          Lobes about 5 ..... f. *cuneata.*
        Leaves elliptical-oblanceolate ..... f. *juvenilis.*
      Lobes oblong, about 3-toothed ..... f. *Houbae.*
    Leaves coarsely subsinuately dentate rather than lobed ..... f. *obovata.*
  Pubescence gray.
    Lobes triangular, entire or 1-toothed, 5 or 7.
      Elongated, mostly outcurved.
        Scales of cup not incurved ..... *Q. Pagoda.*
        Scales of cup incurved ..... f. *incurva.*
      Short or broad, ascending ..... f. *juvenilis.*
    Lobes rounded or margin sinuate ..... f. *sinuata.*
    Lobes oblong when developed.
      Truncate with several teeth ..... f. *leucophylla.*
      Acute, usually toothed on both sides.
        Broad ..... f. *intermedia.*
        Narrow ..... f. *coccinioefolia.*
Leaves glabrescent, with several acute lobes ..... f. *calva.*

QUERCUS RUBRA Linnaeus.

Plate 406.

Quercus rubra Linnaeus, Species Plantarum, p. 996, 1753.—Smith & Abbot, Insects of Ga., vol. 1, p. 99, pl. 50.
Q. nigra digitata Marshall, Arbust. Amer., p. 121, 1785.
?Q. rubra montana Marshall, Arbust. Amer., p. 123, 1785.
Q. rubra B Smith & Abbot, Insects of Ga., vol. 1, p. 27, pl. 14, 1797.
Q. falcata Michaux, Hist. Chênes Amér., pl. 28, 1801.—Michaux, f., Hist. Arb. Amér., vol. 2, pl. 21; N. A. Sylva, vol. 1, pl. 23.—Liebmann-Oersted, Chênes Amér. Trop., pl. A, 22.—Vasey, Amer. Entomol. & Bot., vol. 2, p. 375, f. 226.—Gray, Manual, 7 ed., f. 685.—Houba, Chênes Amér. en Belg., p. 243, pl.—Deam, Rep. Ind. Bd. Forestry, vol. 11, p. 206, pl. 58.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 58.
Q. elongata Mühlenberg in Willdenow, Neue Schr. Ges. Naturf. Fr. Berlin, vol. 3, p. 400, 1801.
Q. aurea Rafinesque, Alsogr. Amer., p. 20, 1838.
Q. discolor Spach, Hist. Vég., vol. 11, p. 163, 1842.
Q. falcata ludoviciana A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 59, 1864.
Q. hypophlaeos Petzold, Arbor. Muscav., p. 646, 1864.
Q. digitata Sudworth, Gard. & For., vol. 5, p. 99, 1892.—Sargent, Silva, vol. 8, pl. 420–421; Manual, f. 196.—Hough, Handbook, p. 150, ff.—Lewis, Trees of Texas, f. 17.—Trelease, Proc. Amer. Philos. Soc., vol. 51, pl. 10.
Q. nobilis Koch, Dendrol., vol. 2, part 2, p. 65, 1873.
Q. cuneata Sargent, Bot. Gaz., vol. 44, p. 226, 1907

Atlantic region of the United States, especially southward, from New Jersey to Florida, Texas, and Missouri; the prototype from Virginia. Referred to as fossil in Pleistocene deposits under one or other of its current names and as *Q. predigitata*.—The Spanish Oak.

As Professor Greene has pointed out, Banister appears to have called this *Q. hispanica* (Ray, Hist. 1688) as well as to have applied other binomial translations of common names, ignored under the rules of nomenclature now followed.—Smithson. Miscell. Collect., vol. 54, p. 36.

Synonyms, so far as I have been able to apply them, seem to pertain to the following forms: f. **triloba** Ashe, Proc. Soc. Amer. Foresters, vol. 11, p. 90, 1916 (*Q. triloba* Michaux,

Hist. Chênes Amér., pl. 26, 1801.—Britton & Shafer, N. A. Trees, f. 247.—Britton & Brown, Ill. Fl., 2 ed., vol. 1, f. 1521.—*Q. falcata triloba* Nuttall, Genera, vol. 2, p. 214, 1818.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 59), which includes in the Michaux plate a form with the elongated leaves acutely lobed throughout with toothed lobes, corresponding to what is called f. **juvenilis**; f. **cuneata**, (*Q. cuneata*, Dippel, Handb., vol. 2, p. 111, f. 52, not *Q. cuneata* Wangenheim), also a juvenile form, attenuate at base and about 5-lobed above; and f. **falcata** (*Q. cuneata falcata* Dippel, *l. c.*, f. 53, 1892), which is merely an exaggeration of the characteristically lobed type to which the elder Michaux (Hist. Chênes. Amér., pl. 28, 1801) gave the name *Q. falcata* almost concurrently with its designation as *Q. elongata* by Willdenow (Neue Schr. Ges. Naturf. Fr. Berlin, vol. 3, p. 400, 1801). The two very aberrant forms called **Houbae** and **obovata** are those figured for *Q. falcata* by Houba (Chênes Amér. en Belg., pl. facing p. 245).

Reported hybrids of *Q. rubra* (under its more familiar synonyms *cuneata*, *digitata*, or *falcata*) are ×*Q. blufftonensis* Trelease, Proc. Amer. Phil. Soc., vol. 56, p. 48, with *Q. laevis;* ×*Q. subfalcata* Trelease, *l. c.*, p. 52 (×*Q. falcata* Ashe, Journ. Elisha Mitchell Sci. Soc., vol. 11, p. 94, 1894—not *Q. falcata* Michaux), with *Q. Phellos;* ×*Q. subintegra* Trelease, *l. c.* (*Q. falcata subintegra* Engelmann, Trans. Acad. St. Louis, vol. 3, p. 543, 1876), with *Q. cinerea;* ×*Q. Willdenowiana* Zabel, H. D. D. G., p. 6, 7, 1903 (*Q. tinctoria Willdenowiana* Dippel, Handb., vol. 2, p. 122, 1892.—×*Q. Sudworthi* Trelease, *l. c.*, p. 52, 1917), with *Q. velutina;* and ×*Q. beaumontiana* Sargent, Bot. Gaz., vol. 65, p. 451, 1918, with *Q.* [*laurifolia*] *rhombica*.—See also ×*Q. Joorii*, with *Shumardii*?.

QUERCUS PAGODA Rafinesque.

Plates 407 and 408.

Quercus Pagoda Rafinesque, Alsographia Americana, p. 23, 1838.—Ashe, Bull. Charleston Mus., vol. 13, p. 26, 1917.

Q. falcata pagodaefolia Elliott, Sk., vol. 2, p. 605, 1824.

Q. pagodaefolia Ashe, Bot. Gaz., vol. 24, p. 375, 1897.—Sargent, Manual, f. 197.—Hough, Handbook, p. 152, ff.—Britton & Shafer, N. A. Trees, f. 248.—Britton & Brown, Ill. Fl., 2 ed., vol. 1, f. 1522.

Q. rubra pagodaefolia Ashe, Proc. Soc. Amer. Foresters, vol. 11, p. 90, 1916.

Southeastern Atlantic region of the United States, from New Jersey to Georgia, Mississippi, Missouri, and Indiana; the type from the Carolinas.—The swamp Spanish oak.

Quercus Carpenterii Riddell, New Orleans Med. & Surg. Journ., vol. 9, p. 613, 1853, from Feliciana, Louisiana (*Carpenter*, Plants of Louisiana, no. *1552*), considered by the collector as a questionable form of the preceding species, agrees in color of pubescence with the present.

As with *Q. velutina*, the lower branches of this species are apt to have foliage with shorter, less pointed lobes than upper branches; and suckers and second growths present characteristic heterophylly comparable with that of *Q. nigra*. Though purely nominal, the several forms that are seen are differentiated in the key to the group because to a casual observer they resemble much more *Q. velutina* or *Q. marilandica* than the species to which they really belong. The only one that may be recognized in literature is *Q. Pagoda leucophylla* Ashe, Journ. Elisha Mitchell Sci. Soc., vol. 34, p. 136, 1918 (*Q. rubra leucophylla* Ashe, Bull. Charleston Mus., vol. 13, p. 25, 1917.—*Q. leucophylla* Ashe, Torreya, vol. 18, p. 73, 1918).

A single hybrid has been reported, ×*Q. ludoviciana* Sargent, Trees & Shrubs, vol. 2, p. 223, 1913, with *Q. Phellos*.

CALOPHYLLAE.—Medium-sized or rather large trees with moderately slender tomentose twigs, ovoid-subfusiform buds, large broadly lanceolate or oblanceolate-obovate petioled aristately toothed or incised leaves raised-reticulate above and densely tomentulose beneath, and biennial rather large fruit with rather loose coarse thin puberulous scales. Sierra Madre region of Mexico.

Eastern.
- Leaves often repand or deeply toothed.
  - Petiole elongated.
    - Outline curved.
      - Margin repand, scarcely toothed.....*Q. calophylla.*
      - Margin deeply serrate.....*f. Schiedeana.*
    - Outline rather straight below the middle.....*f. Willdenovii.*
  - Petiole very short.....*f. flavida.*
- Leaves scarcely repand or deeply toothed.
  - Distinctly acuminate.
    - Oblanceolate-obovate.....*f. acuminata.*
    - Oblong-oblanceolate.....*f. intermedia.*
  - Scarcely more than acute; subtruncate at base.....*f. Alamo.*

Western.
- Leaves often repandly sublobed; petiole short.....*Q. candicans.*
- Leaves not lobed; petiole elongated.
  - Cup not inrolled about the acorn.....*f. michoacana.*
  - Cup inrolled.....*f. incurva.*

QUERCUS CALOPHYLLA Chamisso and Schlechtendal.

Plates 409 to 416.

Quercus calophylla Chamisso & Schlechtendal, Linnaea, vol. 5, p. 79, 1830.—Liebmann-Oersted, Chênes Amér. Trop., pl. B, 1.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 65.

Twigs moderate (3–4 mm.), somewhat fluted, from yellow-floccose glabrate, then reddish or gray. Buds dull brown, glabrescent, ovoid, 2–3×4–6 or finally 10–12 mm. Leaves deciduous?, obovate or elliptical, acute to acuminate, obliquely truncate or subcordately rounded at base, somewhat bristly-serrate above, large (4–7×11–13 cm. or more), slightly glossy, green and glabrous above or puberulent along the midrib, densely creamy-tomentulose beneath with the veins somewhat loosely hairy; veins about 10–12×2, sometimes forking but hardly looped; petiole tomentose, 2×10–15 or exceptionally 30 mm. Catkins: ♂, 50–60 mm. long, dingy-fleecy, with rather distant flowers, the glabrous oblong mucronate anthers somewhat exserted; ♀, 10–20 mm. long, 1- or 2-flowered. Fruit biennial, on a stalk 2×4 mm.; cup hemispherical, typically rather large (20 mm. in diameter), with thin rather lax blunt scales at length brown and glossy; acorn ovoid, 20–25 mm. long, one-third or more included.

Eastern Sierra Madre region of Mexico.—An unusually polymorphic species with soft wood, whence the name of alamo or poplar applied to what has been called *Q. Alamo.*

Though at present none of the diverse forms appears capable of clean segregation, for convenience they may be grouped as follows:

1. The typical form: Leaves obovate, somewhat acuminate, obliquely rounded at base, crisped and often repandly shallow-lobed as well as serrate, becoming as much as 15×25 cm.—Vicinity of Jalapa (*Schiede, 24, 597*, the types; *Galeotti, 95*); Tescatitlan (*Karwinski*, Sept., 1827); Guarda, Guichalapa (*Berlandier, 1051*, 1827); Tenancingo (*Uhde, 4*); Sierra Madre (*Hahn, 1000*); without locality (*Graham, 330*). A shorter-petioled form with divaricate very acute teeth, approaching *Q. candicans*, occurs as of the type and, further, from Jalapa (*Galeotti, 96 bis*), Huatusco (*Purpus*, 1914), and Orizaba (*Botteri, 186; Mueller, 333; Lemmon, 105*), and may be known as f. **Schiedeana.** A comparable juvenile form with the petiole reduced to 3–5 mm. and the leaves usually very irregularly repand or shallow-lobed is f. **flavida:** Chinantla, at 2,300 m. (*Liebmann, 2, 3478*, May, 1841, the type of *Q. flavida* Liebmann, Overs. Dansk. Vidensk. Selsk. Forhandl., 1854, p. 178.—Liebmann-Oersted, Chênes Amér. Trop., p. 24, pl. 2; A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 76); Tenancingo (*Uhde, 270*).

2. f. **acuminata** v. Seemen in herb.: Leaves elliptical to obovate, long-acuminate, scarcely repand, setaceously low-denticulate rather than toothed, measuring as much as 12×22 cm. Scarcely more than an unlobed form of the type.—Totutla (*Galeotti, 96*, the type of *Q. acuminata* Martens & Galeotti, Bull. Acad. Brux., vol. 10, part 2, p. 217, 1843; *133, Q. umbrosa*, Endlicher, Gen. Suppl. 4, part 2, p. 26, 1847; *Sartorius, 1309; Liebmann, 5, 7*, and Aug., Sept., and Oct.,

1841; *Ghiesbreght, 5, 7*); Cordoba (*Fink, 6, 8*); "Oaxaca" (*Franco*, 1842); Talea (*Galeotti, 2; Juergensen, 682*); Capulalpan (*Galeotti, 1*, and without number); Tonaguia (*Galeotti, 4, 6*, and without number); Sta. Maria Alpatlahua (*Liebmann, 8, 3445*); Chinantla (? *Liebmann, 3446; Galeotti, 105*); S. Miguel del Soldado (*Linden, 17*); Comaltepec (*Nelson, 936*); Huatusco (*Purpus*, 1914); without locality (*Uhde, 269; Rathsack, 10, 492*). Said by Martens and Galeotti to reach a height of 25–40 m., the typical form of the species, as represented by Galeotti's *no. 97*, being from 20 to 23 m. What may be called f. **Willdenovii,** with leaves obovate or with the sides narrowed toward the base in straight lines, short-acuminate, shallow-toothed, more or less lobed above, 5–6×12 cm., occurs without locality (*Bonpland, 4270*) in the herbarium of Willdenow under *no. 17613* as representing *Q. mucronata*, by which name, however, Willdenow clearly intended to replace *Q. castanea* of Née because of an earlier use of this name for another species.

3. f. **intermedia** v. Seemen in herb.: Leaves oblong-elliptical, bluntly pointed rather than acuminate, somewhat acute-based, not repand, rather deeply serrate above, measuring scarcely 5×13 cm., passing into the preceding.—Flanks of Mt. Orizaba, at 1,600–2,500 m. (*Galeotti, 132*, the type of *Q. intermedia* Martens & Galeotti, Bull. Acad. Brux., vol. 10, part 1, p. 223, 1843); without data (? *Ghiesbreght, 2*). The height is given as about equaling that of typical *calophylla*. This form is cultivated in the Azores: San Miguel (*Carreiro, 14*).

4. f. **Alamo:** Leaves mostly elliptical-obovate, acute, rather sharply toothed, mostly 5×10–15 cm., but occasionally 11×18 cm.—Huasco (*Hartweg, 423*, the type of *Q. Alamo* Bentham, Plant. Hartweg., p. 55, 1842.—v. Ettingshausen, Denkschr. K. Akad. Wien, vol. 15, part 1, pl. 10); Omitlan (*Ehrenberg, 990*, and without number). Cultivated in the Azores: San Miguel (*Correa, 13*).

QUERCUS CANDICANS Née.

Plates 417 and 418.

Quercus candicans Née, Anal. Cienc. Nat. vol. 3, p. 277, 1801.—Liebmann-Oersted, Chênes Amér. Trop., pl. 7.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 75.

Twigs moderate (3 mm.), somewhat fluted, tomentose or finally glabrate, with rather evident pale lenticels. Buds glabrescent, ovoid, or conical-ovoid, 3×5–7 mm. or more. Leaves deciduous, elliptical-obovate, rather acute or short-acuminate, subcuneately narrowed to rounded at base or slightly truncate-cordate, aristately repand to rather deeply lobed, typically large (10–15×15–25 cm.), somewhat glossy and glabresent above, densely creamy-tomentulose beneath and with the veins at first loosely hairy; veins about 12×2, those passing into the sinuses lighter, branching but hardly looped; petiole tomentose, 2×10–15 mm. Flowers and fruit?.

Western Sierra Madre region of Mexico.—A moderate-sized tree, the type from about Tixtla.

Specimens examined.—Cerro Grande, Jalisco (*Burnett*, called encino de Asta, yielding a good lumber with red sap-wood and dark heart marked by darker stripes).

To the foregoing type, the following form bears the same relation that *Q. calophylls* does to f. *flavida*. For distinction, though it is believed to represent the more normal form of the species, it may be called f. **michoacana.** Leaves rather thick, very green above, elliptical-ovate, rather shallow-toothed, 4–8×10–14 cm. Fruit biennial, subsessile; cup deep-saucer-shaped, rather large (25 mm. in diameter), with rather loose thin somewhat blunt-pointed more or less canescent scales; acorn round-ovoid, half-included.—Without locality (*Pavon*, doubtless a cotype and collected by Née).—Patzcuaro (*Pringle, 3955*, the type), Mt. Tancitaro (*Nelson, 6903*); Tarascon (*Pringle, 8839*); Sierra de Tepoxtlan (*Pringle, 8001*); Huitchilac, near Cuernavaca (*Hahn, 376*); near Colima (*Fernow, 2; Ross, 512; Woods*, Mar., 1910); Colomas, Sinaloa (*?Rose*, 1897); Cerro Grande, Jalisco (*Burnett*, as encino de Asta); Omilteme (*Nelson, 7061*); Mte. del Burro (*Langlassé, 46*, the wood noted as red and very hard); Sta. Teresa, Tepic (*Rose, 3446*); Cainoho (*Arsène*, 1911); Campanario (*Arsène, 5806, 6038*); Cuincho cascade (*Arsène, 5419*); all near Morelia, Michoacan.

From this, except that the cups have the margin inrolled—f. **incurva**—I do not distinguish specimens from about Bolaños (*Rose, 2999*).

AGRIFOLIAE.—Trees or shrubs with rather slender for a time tomentose twigs, ovoid-conical buds, moderately large to rather small deeply lobed to repandly dentate elliptical leaves, and annual or biennial subsessile moderate oblong fruit with thin rather loose and large brown scales.—Californian region.

Leaves pinnately lobed and incised.
- Trees.....*Q. Kelloggii.*
- Shrubs.....f. *cibata.*

Leaves subserrately lobed.....×*Q. moreha.*

Leaves not lobed, smaller.
- Fruit biennial.
  - Trees.
    - Acorns over 3 cm. long.....*Q. Wislizeni.*
    - Acorn scarcely 2 cm. long.....f. *extima.*
  - Shrubs.
    - Leaves repand-dentate.....v. *frutescens.*
    - Leaves subentire.....f. *parvula.*
- Fruit annual.
  - Cup deep.
    - Trees.....*Q. agrifolia.*
    - Shrubs.....v. *frutescens.*
  - Cup shallow, with fine scales.....*Q. Pricei.*

QUERCUS KELLOGGII Newberry.

Plate 419.

Quercus Kelloggii Newberry, Pac. R. R. Rep., vol. 6, p. 28, 89, f. 6, 1859.—Robert Brown, Campst., Horae Sylvanae, f. 4–6.—Greene, Ill. W. A. Oaks, pl. 1.—Britton & Shafer, N. A. Trees, f. 246.—Jepson, Silva Calif., pl. 70.—Trelease, Proc., Amer. Philos. Soc., vol. 51, pl. 13.

Q. tinctoria californica Torrey, Pac. R. R. Rep., vol. 4, part 5, p. 138, 1856.

Q. californica Cooper, Smithson. Rep., for 1858, p. 261, 1859.—Sargent, Silva, vol 8, pl. 416; Manual, f. 193.—Sudworth, For. Trees Pac. Slope, f. 145–7.—Eastwood, Occ. Papers Calif. Acad., no. 9, pl. 26.

Q. sonomensis A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 62, 1864.

Californian region from Oregon southwards in the western Sierras and coast range; the Candollean type from Sonoma.—Called black oak.

A shrubby form is f. **cibata** Jepson, Silva Calif., p. 233, 1910. Several forms of this polymorphic species have been given herbarium names by Hansen.

A thicket-forming hybrid with *Q. Wislizeni*, fancifully called Abraham's oak or the Moreh oak (*cf.* Lamb, Journ. Washington Acad. Sci., vol. 6, p. 657) is ×*Q. moreha* Trelease, Proc. Am. Philos. Soc., vol. 56, p. 50, 1917 (*Q. Morehus* Kellogg, Proc. Calif. Acad., vol. 2, p. 36, 1863.—Eastwood, Occ. Papers Calif. Acad., no. 9, pl. 26.—Greene, Ill. W. Am. Oaks, pl. 2.—Sargent, Silva, vol. 8, pl. 407.—Sudworth, Forest Trees Pac. Slope, f. 312).

QUERCUS WISLIZENI A. DE CANDOLLE.

Plate 419.

Quercus Wislizeni A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 67. 1864.—Greene, Ill. W. A. Oaks, pl. 3–4.—Sargent, Silva, vol. 8, pl. 406; Manual, f. 206.—Sudworth, For. Trees Pac. Slope, f. 141–2.—Britton & Shafer, N. A. Trees, f. 259.—Jepson, Silva Calif. pl. 70, 72.—Eastwood, Occ. Papers Calif. Acad. no. 9, pl. 26.—Trelease, Proc. Amer. Philos. Soc., vol. 51, pl. 13.

Californian region, within the United States, in the Sierras and southward; the type, erroneously ascribed to the Mexican State of Chihuahua, really from the American fork of the Sacramento River, California (Sargent, Silva, vol. 8, p. 121).—The interior or highland live oak of California.

With smaller acorns, scarcely 2 cm. long, it is var. *extima* Jepson, Fl. Calif., p. 361, 1909. Shrubby forms are var. *frutescens* Engelmann, Trans. Acad. St. Louis, vol. 3, p. 396, 1876, and f. **parvula** (*Q. parvula* Greene, Pittonia, vol. 1, p. 40, 1887).

A hybrid of this species with *Q. Kelloggii* is ×*Q. Morehus* [14] Kellogg, Proc. Calif. Acad., vol. 2, p. 36, 1863.—Greene, Ill. W. A. Oaks, pl. 2.—Sargent, Silva, vol. 8, pl. 407.—A. de Candolle in de Candolle, Prodromus vol. 16, part 2, p. 787.

QUERCUS AGRIFOLIA Née.

Plate 420.

Quercus agrifolia Née, An. Cienc. Nat., vol. 3, p. 271, 1801.—Nuttall, Sylva, vol. 1, pl. 2; Journ. Hort. Soc., vol. 6, p. 157, pl.—Hooker, Icones Plant, vol. 4, pl. 377.—Liebmann-Oersted, Chênes Amér. Trop., pl. 44.—Oersted, Vidensk. Meddel. Naturhist. Foren. Kjöbenhavn, 1869, p. 59–67, f.—Newberry, Pac. R. R. Rep., vol. 6, p. 32, f. 9.—Carrière, Fl. des Serres, vol. 7, p. 137, f.—Greene, Ill. W. A. Oaks, pl. 5.—Dippel, Handb. Laubholzk., vol. 2, f. 61.—Sargent, Silva, vol. 8, pl. 403; Manual, f. 208.—Eastwood, Occ. Papers Calif. Acad. no. 9, pl. 26.—Sudworth, For. Trees Pac. Slope, f. 138–140.—Britton & Shafer, N. A. Trees, f. 261.—Jepson, Silva, Calif., pl. 70, 71.—Dippel, Handb., vol. 2, p. 125, f. 61.—Trelease. Proc. Amer. Philos. Soc., vol. 51, pl. 13.—A. de Candolle in de Candolle, Prodromus, vol. 16, part 2, p. 37.

Q. oxyadenia Torrey in Sitgreaves, Rep., p. 172, pl. 17, 1853.

Q. acroglandis Kellogg, Proc. Calif. Acad., vol. 1, p. 25, 1855.

Q. acutiglandis Sargent, Rep. Tenth Census, vol. 9, p. 146, 1884.

Californian region, in the coast range, etc., possibly extending below the international boundary, the type from Monterey.[15] Fossil in Pleistocene deposits.—The coast live oak or encina of California.

A shrubby form is var. *frutescens*, Engelmann in Brewer & Watson, Bot. Calif., vol. 2, p. 98, 1880.

The curious *Juglans californica quercina* Babcock has been taken more or less seriously for a cross between this oak and the Californian walnut.

QUERCUS PRICEI Sudworth.

Plate 420

Quercus Pricei Sudworth, Forestry & Irrigation, vol. 13, p. 157, 1907; Forest Trees of Pac. Slope, f. 143, 1908.

Californian region, in the coast range; the type from Monterey County, associated with and hardly separable from *Q. agrifolia*.

[14] This name, an adjective based on Mt. Moreh—should be written *moreha*—*cf.* Trelease, Proc. Am. Philos. Soc., vol. 56, p. 50, 1917.

[15] The name perhaps was written by Née ACRIFOLIA *or aquifolia*, from either of which it could have assumed its present form easily when being copied.

REFERENCES.

Though all publications bearing taxonomically on the Fagaceae have been examined as far as possible, no effort has been made to prepare anything like a complete bibliography of Quercus. This would be very large, especially if it referred to economic aspects of the subject including the extensive literature of galls. The following list of publications therefore is not to be considered as exhaustive. It includes merely those which bear on the nomenclature or essential structure of existing American oaks or in which illustrations of historical significance or botanical worth appear. Except for a few of the more comprehensive, none of the many publications on fossil oaks is included, though all which appear to bear on questions of nomenclature are summarily referred to in the enumeration of fossil species. Publications that have appeared in several places or languages without essential change of content are cited in the particular form under my eye when the bibliography was compiled unless questions of priority in nomenclature hinge upon the date of publication. Because of its suggestiveness, a chronological sequence has been selected in arranging the titles.

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1731. Catesby, M. Natural history of Carolina.

1753. Linnaeus, C. Species plantarum.
The work underwent so many alterations in posthumous editions that these—*e. g.*, the fourth, edited by Willdenow—are usually referred to under the names of these writers.

1768. Miller, P. Gardeners' Dictionary, 8 ed.
The critical edition, nomenclatorially, since it introduces binomials.

1770. Muenchhausen, O. Der Hausvater, vol. 5.

1771. Du Roi, J. P. Die harbkesche wilde Baumzucht, vol. 2.

1783. Lamarck, J. B. A. P. M. Encyclopédie méthodique. Botanique, vol. 1.

1784. Thunberg, C. P. Flora japonica.

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1787. v. Wangenheim, F. A. J. Beytrag zur teutschen holzgerechten Forstwissenschaft.

1788. Walter, F. Flora caroliniana.

1789. Aiton, W. Hortus kewensis, vol. 3.

1790. Castiglioni, L. Viaggio negli Stati Uniti.

1791. Bartram, W. Travels through North and South Carolina.
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1812. Michaux, F. A. (Cited as Michaux f.). Histoire des arbres forestières de l' Amérique septentrionale, vol. 2.

1813. Lapeyrouse, P. P. Histoire abrégée des plantes des pyrenées.

1813. Mühlenberg, G. H. E. Catalogues plantarum Americae Septentrionalis.

1814. Pursh, F. Flora Americae Septentrionalis, vol. 2.

1818. Nuttall, T. Genera of North American plants, vol. 2.

1819. Michaux, F. A. North American sylva, vol. 2.

1824. Elliott, S. Sketch of the botany of South Carolina and Georgia.

1825. Blume, C. L. Bijdragen tot de flora van nederlandsch Indië.

1826. SWEET, R. Hortus britannicus.
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FIGURES AND PLATES.

EXPLANATION OF TEXT FIGURES.

FIGURE 1 (p. 6). Cross section of petiole of *Quercus palustris*, showing the double bundle (3–4 and 5–6) common in deciduous oaks: 1, Cortical parenchyma; 2, Sclerotic pericycle; 3, (6), Soft bast; 4, 5, Xylem; 7, Medullary parenchyma. ×25.

FIGURE 2 (p. 9). Androecium of a staminate flower of *Quercus macrocarpa*, showing unmistakably extrorse anthers. ×10.

FIGURE 3 (p. 10). Longitudinal section through a pistillate flower of *Quercus macrocarpa* (representative of Leucobalanus), about a month after blooming: 1, Cup; 2, Ovary with developing seeds; 3, Stylopodium; 4, Perianth; 5, Bases of styles. ×5.

FIGURE 4 (p. 10). Longitudinal section through a pistillate flower of *Quercus imbricaria* (representative of Erythrobalanus), about a month after blooming: 1, Cup; 2, Beginning of ovary; 3, Stylopodium; 4, Perianth, with revolute collar at base, interlocking with the inner scales of the cup; 5, Bases of styles. ×25.

FIGURE 5 (p. 10). Cross section through a pistillate flower of *Quercus macrocarpa* about a month after blooming: 1, Cup; 2, Wall of ovary; 3, Parietal placentae with developing ovules. ×5.

FIGURE 6 (p. 11). Mature acorn of *Quercus palustris* (representative of Erythrobalanus) with the tomentose wall in section; the single seed with five abortive ovules at its top. ×2.

FIGURE 7 (p. 11). Mature acorn of *Quercus alba* (representative of Leucobalanus), with the glabrous wall in section; the single seed with five abortive ovules near its base. ×2.

EXPLANATION OF PLATES.

With few exceptions, noted in the explanations, the foliage and fruit illustrations are of natural size, photographed by the author or from outlines prepared by him. Habit plates are necessarily much reduced. Details of wood structure are enlarged four diameters.

FRONTISPIECE. DISTRIBUTION MAP, showing the principal regions indicated by the genus Quercus.

North America: (1) Atlantic, approximately that drained by the Mississippi River and its tributaries; (2) Rocky Mountain; (3) Chihuahuan, in general connecting the Rocky Mountain and Sierra Madre Ranges, and rising into the table-land in the south; (4) Californian, of which the Sonoran or Desert region is a southern extension; (5) Western Sierra Madre and (6) Eastern Sierra Madre, flanking the Mexican table-land and blending in the south into (7) The Cordilleran; (8) Central American with its lower extension (9) The Isthmian.

South America: Andean, containing Quercus only in a few Colombian valleys.

West Indies: Antillean, with only a single oak, in Cuba, of an Atlantic region type.

Pacific Islands: With a single oak on Guadalupe, of a Californian type.

PLATE 1. QUERCUS. *Habit of growth.* An oblong type, *Q. palustris.* Photographed in Illinois by Dr. C. F. Millspaugh; reproduced by permission from negative at the Field Museum, Chicago.

PLATE 2. QUERCUS. *Habit of growth.* A spreading type, *Q. macrocarpa.* Photographed in Mississippi by Dr. C. F. Millspaugh; reproduced by permission from negative at the Field Museum, Chicago.

PLATE 3. QUERCUS. *Habit of growth.* A round type, *Q. pilicaulis Hurteri.* Photographed near Quezaltenango, Guatemala, by Mr. G. Hurter.

PLATE 4. QUERCUS. *Bark types.* 1. Q. PILICAULIS HURTERI, with representative Leucobalanus bark (Guatemala). 2. Q. VELUTINA, with representative Erythrobalanus bark (Illinois).

PLATE 5. FAGACEAE. *Generic wood types.* 1. CASTANOPSIS CHRYSOPHYLLA, lacking heavy medullary rays. 2. PASANIA DENSIFLORA, with heavy rays as in Quercus. Photographed from Hough's American Woods (1, no. 139; 2, no. 138). ×4.

PLATE 6. QUERCUS. *European wood types.* 1. QUERCUS CERRIS (§ Cerris). 2. QUERCUS PEDUNCULATA (§ Leucobalanus). A deciduous species. Photographed from Nördlinger's Querschnitte. ×4.

PLATE 7. QUERCUS. *European wood types.* 1. QUERCUS ILEX. 2. QUERCUS SUBER. Two evergreen white oaks. Photographed from Nördlinge 's Querschnitte. ×4.

PLATE 8. QUERCUS. *American wood types.* 1. QUERCUS ALBA. (§ Leucobalanus). 2. QUERCUS PHELLOS (§ Erythrobalanus). Two deciduous species. Photographed from Hough's American Woods (1, no. 38; 2, no. 271). ×4.

PLATE 9. QUERCUS. *American wood types.* 1. QUERCUS EMORYI (§Erythrobalanus). 2. QUERCUS CHRYSOLEPIS (§ Protobalanus). Photographed from Hough's American Woods (1, no. 234; 2, no. 161). ×4.

PLATE 10. QUERCUS. *Pubescence types.* 1. QUERCUS STELLATA, with stellately roughened upper surface. 2. QUERCUS PALUSTRIS, with axillary tufts or domatia on the lower surface. Photographed from Illinois leaves. ×4.

PLATE 11. QUERCUS. *Cretaceous American Oaks.* 1. QUERCUS HIERACIFOLIA (after Lesquereux, Monogr. U. S. Geol. Surv., vol. 17, pl. 3). 2. QUERCUS HOLLICKII (after Berry, Bull. Torrey Bot. Club, vol. 31, pl. 3). 3. QUERCUS LESQUEREUXIANA (after Lesquereux, Rep. U. S. Geol. Surv., vol. 7, pl. 19, as *Q. acrodon*). 4. QUERCUS FLEXUOSA (after Hollick, Monogr. U. S. Geol. Surv., vol. 35, pl. 19). 5. QUERCUS BANKSIAEFOLIA (after Hollick, *l. c.*, pl. 18).

6. QUERCUS PREANGUSTILOBA (after Lesquereux, Rept. U. S. Geol. Surv., vol. 7, pl. 21, as *Q. angustiloba*). 7. QUERCUS WARDIANA (after Lesquereux, Monogr. U. S. Geol. Surv., vol. 17, pl. 7). 8. QUERCUS PRAE-UNDULATA (after Hollick, Monogr. U. S. Geol. Surv., vol. 35, pl. 13, as *Q. sinuata*), 9. QUERCUS CORIACEA (after Hollick, *l. c.*, pl. 19). 10. QUERCUS HAYDENI (after Lesquereux Rep. U. S. Geol. Surv., vol. 7, pl. 19). 11. QUERCUS SPURIO-ILEX (after Knowlton, Monogr. U. S. Geol. Surv., vol. 17, pl. 48). 12. QUERCUS SUSPECTA (after Lesquereux, Monogr. U. S. Geol. Surv., vol. 17, pl. 47).

PLATE 12. QUERCUS. *Eocene American Oaks.* 1. QUERCUS NEGUNDOIDES (after Lesquereux, Rep. U. S. Geol. Surv., vol. 7, pl. 21). 2. QUERCUS PAUCIDENTATA (after Lesquereux, Rep. U. S. Geol. Surv., vol. 8, pl. 53). 3. QUERCUS DALLII (after Lesquereux, Proc. U. S. Nat. Mus., vol. 5, pl. 8). 4. QUERCUS VIBURNIFOLIA (after Lesquereux, Rep. U. S. Geol. Surv., vol. 7, pl. 20). 5. QUERCUS CONSIMILIS (after Hollick, Monogr. U. S. Geol. Surv., vol. 35, pl. 43). 6. QUERCUS MAGNIFOLIA (after Knowlton, Monogr. U. S. Geol. Surv., vol. 32, pt. 2, pl. 88). 7. QUERCUS YANCEYI (after Knowlton, *l. c.*, pl. 89). 8. "QUERCUS NERIIFOLIA" (after Lesquereux, Rep. U. S. Geol. Surv., vol. 8, pl. 31). 9. QUERCUS PSEUDO-ALNUS (after Lesquereux, Rep. U. S. Geol. Surv., vol. 8, pl. 53). 10. QUERCUS DUBIA (after Hollick, Monogr. U. S. Geol. Surv., vol. 35, pl. 37).

PLATE 13. QUERCUS. *Miocene American Oaks.* 1. QUERCUS GROSSI-DENTATA (after Knowlton, Monogr. U. S. Geol. Surv., vol. 32, pt. 2, pl. 87). 2. QUERCUS HORNIANA (after Knowlton, Bull. U. S. Geol. Surv., no. 204, pl. 8). 3. QUERCUS FLORISSANTENSIS (after Lesquereux, Rep. U. S. Geol. Surv., vol. 8, pl. 28, as *Q. pyrifolia*). 4. QUERCUS MERRIAMI (after Knowlton, Bull. U. S. Geol. Surv., no. 204, pl. 7). 5. QUERCUS PSEUDOLYRATA LATIFOLIA (after Lesquereux, Proc. U. S. Nat. Mus., vol. 11, pl. 12). 6. QUERCUS URSINA (after Knowlton, Bull. U. S. Geol. Surv., no. 204, pl. 7). 7. QUERCUS OSBORNII (after Lesquereux, Rep. U. S. Geol. Surv., vol. 8, pl. 38). 8. QUERCUS CONVEXA (after Lesquereux, Mem. Mus. Comp. Zool., vol. 16, pt. 2, pl. 1). 9. QUERCUS "TURNERI" (after Knowlton, Rep. U. S. Geol. Surv., vol. 21, pt. 2, pl. 30). 10. QUERCUS PERITULA (after Lesquereux, Rep. U. S. Geol. Surv., vol. 8, pl. 28, as *Q. mediterranea*).

PLATE 14. QUERCUS INSIGNIS. The type (Mexico, *Galeotti, 125*). Photographed for Professor Charles Bommer in the herbarium of the botanical garden at Brussels.

PLATE 15. QUERCUS INSIGNIS. Fruits from the type region: a (*Rathsack, 1110*); photographed by permission in the herbarium of the botanical garden at Copenhagen; b (*Purpus*, 1912).

PLATE 16. QUERCUS INSIGNIS. Fruits of the type number (*Galeotti, 125*). Photographed by permission in the herbarium of the botanical museum at Budapest. The fruits occur with a single label; the conical acorn, no doubt, is cotypical of *Q. insignis strombocarpoides.*

PLATE 17. QUERCUS STROMBOCARPA. Type material (Mexico, foliage, *Liebmann, 174=3563*; fruit, *Liebmann*, Nov., 1841). Photographed by permission at Copenhagen.

PLATE 18. QUERCUS OOCARPA. Typical fruit (Guatemala, *von Warscewicz, 50*), photographed by permission in the Boissier herbarium at Chambézy; and foliage of the type (*von Warscewicz, 50 a*), photographed by permission in the herbarium of the botanical museum at Dahlem.

PLATE 19. QUERCUS PILARIUS. The type (Mexico, *Reeves*, 1918).

PLATE 20. QUERCUS CYCLOBALANOIDES. The type (Mexico, *Purpus*, 1914).

PLATE 21. QUERCUS CYCLOBALANOIDES. The type (Mexico, *Purpus*, 1914).

PLATE 22. QUERCUS REEVESII. The type (Guatemala, *Reeves*, 1917, the fruit of 1918).

PLATE 23. QUERCUS CORRUGATA. The type (Guatemala, *Skinner, 5*). Photographed by permission at the Royal Gardens, Kew.

PLATE 24. QUERCUS CORRUGATA GRANULIFERA. The type (Guatemala, *von Warscewicz, 11*). Photographed by permission at Dahlem.

PLATE 25. QUERCUS GALEOTTII. The type (Mexico, *Galeotti, 126*). Photographed for Professor Bommer at Brussels.

PLATE 26. QUERCUS GALEOTTII, fruit. a, Type collection (Mexico, *Galeotti, 126*); photographed by permission at Budapest. b, Another collection (Mexico, *Liebmann*, 1841); photographed by permission at Copenhagen.

PLATE 27. QUERCUS PILGERIANA. The type (Costa Rica, *Pittier, 2197*). Photographed for Professor Bommer at Brussels.

PLATE 28. QUERCUS FINALENSIS. a, The type as of *Q. cuneifolia* (Mexico, *Seemann, 1456*). Photographed by permission at Kew. b, QUERCUS CHINANTLENSIS. The type (Mexico, (*Liebmann, 3471*). Photographed by permission at Copenhagen.

PLATE 29. QUERCUS EXCELSA. The type (Mexico, *Liebmann, 3477*). Photographed by permission at Copenhagen.

PLATE 30. QUERCUS EXCELSA. Fruit. a (?Mexico, without data). Photographed by permission at Copenhagen. b (Mexico, *Purpus, 7385*); photographed at Urbana.

PLATE 31. QUERCUS LEIOPHYLLA. a, The type (Mexico, *Liebmann*). Photographed by permission in the Candollean herbarium at Geneva. b, A larger-leaved specimen of the same collection. Photographed by permission at Budapest.

PLATE 32. QUERCUS LANCIFOLIA. a, The type (Mexico, *Scheide, 15*). b, The type of *Q. lancefolia pilosiuscula* (Mexico, *Scheide*, 1829). Both photographed by permission at Dahlem.

PLATE 33. QUERCUS TOXICODENDRIFOLIA. The type (Mexico, *Berlandier*, 1827). Photographed by permission in the natural history museum at Vienna. b, QUERCUS BOQUERONAE. The type (Mexico, *Purpus, 6997*). Photographed at Urbana.

PLATE 34. QUERCUS GLABRESCENS. a, The type collection (Mexico, *Hartweg, 428*). Photographed by permission at Dahlem. b, QUERCUS GLABRESCENS INTEGRIFOLIA. The type (Mexico, *Liebmann, 166*). Photographed by permission at Copenhagen.

PLATE 35. QUERCUS RADLKOFERIANA. a, The type (Mexico, *Liebmann, 156*). b, Another collection (Mexico, *Pringle, 6277*). Both photographed by permission at Dahlem.

PLATE 36. QUERCUS POLYMORPHA. a, The type (Mexico, *Schiede, 20*). b, The type collection of *Q. petiolaris* (Mexico, *Hartweg, 420*). Both photographed by permission at Dahlem.

PLATE 37. QUERCUS POLYMORPHA. The type of *Q. varians* (Mexico, *Galeotti, 92*). Photographed for Professor Bommer at Brussels.

PLATE 38. a, QUERCUS POLYMORPHA. Northern form with acute-based leaves (Mexico, *Pringle, 10200*). Photographed by permission at Dahlem. b, QUERCUS JUERGENSENII. The only known material, to be considered as typical (?Mexico, *Liebmann*, without data). Photographed by permission at Copenhagen.

PLATE 39. QUERCUS PORPHYROGENITA. Type material (Mexico, *Trelease;* a, *117*, b, *118*). Photographed in the Missouri Botanical Garden at St. Louis.

PLATE 40. QUERCUS GERMANA. a, The type (Mexico, *Schiede, 21*). Photographed by permission at Dahlem. b, The type of *Q. gibbosa* Fournier in herb. (Mexico, *Hahn, 278*). Photographed by permission at Copenhagen.

PLATE 41. QUERCUS SUBSTENOCARPA. The type (Mexico, *Pringle, 3969*, as *Q. stenobalanus* Wenzig, in herb.) Photographed for Professor Bommer at Brussels.

PLATE 42. QUERCUS GLAUCOIDES. The type (Mexico, *Galeotti, 103*). Photographed for Professor Bommer at Brussels.

PLATE 43. a, QUERCUS GLAUCOIDES (Mexico, *Conzatti, 1821*). b, QUERCUS BALDOQUINAE. The type (Mexico, *Endlich, 1354*). Both photographed by permission at Dahlem.

PLATE 44. QUERCUS GLAUCOPHYLLA. The type collection (Mexico, *Pringle, 4843*). Photographed for Professor Bommer at Brussels.

PLATE 45. a, QUERCUS GLAUCOPHYLLA TLACOLULANA. The type (Mexico, *Seler, 1752*). b, QUERCUS HARMSIANA. The type (Mexico, *Endlich, 1356*). Both photographed by permission at Dahlem.

PLATE 46. QUERCUS MIXTECANA. The type (Mexico, *Schenck, 235*). Photographed by permission at Dahlem.

PLATE 47. QUERCUS SORORIA. a, The type, as also of *Q. glauca* Oerst. (Mexico, *Liebmann, 3562*). Photographed by permission at Copenhagen. b, Another collection (Mexico, *Galeotti, 7b*). Photographed by permission at Dahlem.

PLATE 48. QUERCUS CONJUNGENS. The type (Mexico, *Pringle, 8841*). Photographed by permission: a, At Dahlem; b, in the Boissier herbarium at Chambézy.

PLATE 49. QUERCUS CANCELLATA. a, The type (Mexico, *Schenck, 236*). b, A second collection (Mexico, *Schenck, 92*). Both photographed by permission at Dahlem.

PLATE 50. QUERCUS GLAUCESCENS. The type collection (Mexico, *Bonpland, 3921*). Photographed by permission at Dahlem.

PLATE 51. a, QUERCUS TUBERCULATA. The type (Mexico, *Seemann, 2970*). Photographed by permission at Kew. b, QUERCUS IDONEA. The type (Mexico, *Goldman, 7452*). Photographed by permission in the U. S. National herbarium at Washington.

PLATE 52. a, QUERCUS SUBSPATHULATA. The type (Mexico, *Rose, 2239*). Photographed by permission at Washington. b, QUERCUS CRENATIFOLIA. The type (Mexico, *Jones, 440*). Photographed in the Missouri Botanical Garden at St. Louis.

PLATE 53. a, QUERCUS AURANTIACA. The type (Mexico, *Endlich, 770*). Photographed by permission at Dahlem. b, QUERCUS STANDLEYI. The type (Mexico, *Rose, Standley & Russell, 12789*). Photographed by permission at Washington.

PLATE 54. a, QUERCUS SEGOVIENSIS. The type (Nicaragua, *Oersted, 3559*). Photographed by permission at Copenhagen. b, QUERCUS MATAGALPANA. The type (Nicaragua, *Rothschuh, 611*). Photographed by permission at Dahlem.

PLATE 55. QUERCUS ARACHNOIDEA. The type (El Salvador, *Niederlein*, 1898). Photographed by permission at Dahlem.

PLATE 56. QUERCUS MARTENSIANA. The type of *Q. affinis* M. & G. (Mexico, *Galeotti, 90*). Photographed for Professor Bommer at Brussels.

PLATE 57. QUERCUS REKONIS. The type (Mexico, *Reko, 3121*). Photographed by permission at Washington.

PLATE 58. a, QUERCUS MARTENSIANA. (Mexico, *Liebmann*, 1841) Photographed by permission at Dahlem. b, QUERCUS PRINOPSIS. The type (Mexico, *Purpus, 4941*). Photographed at St. Louis.

PLATE 59. QUERCUS CHARTACEA. a, The type (Mexico, *Seler, 62*). b, Another collection, in flower (Mexico, *Seler, 1593*). Both photographed by permission at Dahlem.

PLATE 60. QUERCUS CENTRALIS. a, The type (Mexico, *Endlich, 1365c*). Photographed by permission at Dahlem. b, A flowering specimen (Mexico, *Pringle, 7540*). Photographed by permission in the Arnold Arboretum at Jamaica Plain.

PLATE 61. QUERCUS OBTUSATA PANDURATA. The type collection of *Q. pandurata* (Mexico, *Bonpland 4330*). Photographed by permission in the Willdenow herbarium at Dahlem.

PLATE 62. a, QUERCUS OBTUSATA. The type collection (Mexico, *Bonpland, 4329*). Photographed by permission in the Willdenow herbarium at Dahlem. b, QUERCUS PANDURIFORMIS. The type (Mexico, *Ross, 579*). Photographed by permission in the herbarium of the Academy at Munich.

PLATE 63. QUERCUS PANDURIFORMIS. (Mexico, *Burnett*, 1913). Photographed by permission in the herbarium of the United States Department of Agriculture at Washington. b, QUERCUS PANDURIFORMIS COLIMENSIS. The type (Mexico, *Ross*, *497*). Photographed by permission at Munich.

PLATE 64. QUERCUS PURULHANA. The type sheet ×1/3, and a portion of it in natural size (Guatemala, *Pittier*, *163*). Photographed by permission at Washington.

PLATE 65. QUERCUS MACROPHYLLA. a, Sketch, reduced, of the type made for Professor Lange at Madrid. Photographed by permission at Copenhagen. b, A western collection (Mexico, *Pringle*, *6220* . Photographed by permission in the National Museum at Prag.

PLATE 66. QUERCUS MACROPHYLLA. A table-land collection: a, reduced; b, in natural size (Mexico, *Bonpland*, *4405*). Photographed by permission in the Willdenow herbarium (*no. 17615*) at Dahlem.

PLATE 67. QUERCUS MACROPHYLLA. Staminate and pistillate flowering specimens (Mexico, *Schumann*, *1312*). Photographed by permission at Dahlem.

PLATE 68. QUERCUS RESINOSA. The type (Mexico, *Seemann*, *1972*). Photographed by permission in the Hookerian herbarium at Kew.

PLATE 69. QUERCUS POCULIFER. The type (Mexico, *Pringle*, *4760*). Photographed by permission at St. Louis.

PLATE 70. QUERCUS NUDINERVIS. The type (Mexico, *Seemann*, *1457*). Photographed by permission in the Hookerian herbarium at Kew.

PLATE 71. QUERCUS CIRCINATA. A modern collection (Mexico, *Endlich*, *1352*). Photographed by permission at Dahlem.

PLATE 72. QUERCUS MAGNOLIAEFOLIA. a, Sketch of the type, reduced, made for Professor Lange at Madrid. Photographed by permission at Copenhagen. b, A recent collection (Mexico, *Jones*, *444*). Photographed at St. Louis.

PLATE 73. QUERCUS LUTEA. a, Sketch of the type, reduced, made for Professor Lange at Madrid. Photographed by permission at Copenhagen. b, A more recent collection (Mexico, *Gregg*, *976*). Photographed at St. Louis.

PLATE 74. QUERCUS HAEMATOPHLEBIA. The type (Mexico, *Rose*, *3363*). Photographed by permission at Washington.

PLATE 75. a, QUERCUS LIEBMANNII. The type (Mexico, *Liebmann*, *89=5742*. b, QUERCUS LIEBMANNII BREVIPES. The type (Mexico, *Liebmann*, *136=3526*). Both photographed by permission at Copenhagen.

PLATE 76. QUERCUS BARBEYANA. The type (Guatemala, *Lehmann*, *1711*). Photographed by permission in the Barbey-Boissier herbarium at Chambézy, near Geneva.

PLATE 77. QUERCUS PILICAULIS. a, The type (Guatemala, *von Warscewicz*, *43*). Photographed by permission at Dahlem. b, The type of *Q. tomentosa abbreviata* (Guatemala, *von Warscewicz*, *43*). Photographed by permission at Chambézy.

PLATE 78. QUERCUS PILICAULIS MACRODONTA. a, The type (Guatemala, *von Warscewicz*, *15*). Photographed by permission at Dahlem. b, The type of *Q. tomentosa bullata* (Guatemala *von Warscewicz*, *15*). Photographed by permission at Chambézy.

PLATE 79. a. QUERCUS PILICAULIS OBOVALIS. The type (Guatemala, *Lehmann*, *1725*). Photographed by permission at Dahlem. b, QUERCUS PILICAULIS ARMATA. The type (Guatemala, *Nelson*, *3721*). Photographed by permission at Washington.

PLATE 80. QUERCUS PILICAULIS HURTERI. The type (Guatemala, *Trelease*, *37*). Photographed at Urbana.

PLATE 81. QUERCUS BARBANTHERA. The type (Mexico, *Seler*, *2586*). Photographed by permission at Dahlem.

PLATE 82. QUERCUS CALLOSA. a, The type (Guatemala, *Hartweg*, *616*). Photographed by permission at Kew. b, A very long-peduncled form (Honduras, *Scherzer*, *1853*). Photographed by permission at Vienna.

PLATE 83. QUERCUS PEDUNCULARIS. A supposed cotype (Mexico: *Herb. Thibaud.*). Photographed by permission in the Candollean herbarium at Geneva.

PLATE 84. QUERCUS HARTWEGI. The type collection (Mexico, *Hartweg*, *432*). Photographed by permission: a, in the Benthamian herbarium at Kew; b, at Dahlem.

PLATE 85. QUERCUS LAXA. The type collection (Mexico, *Seemann*, *1967*). Photographed by permission: a, at Kew; b, at Copenhagen.

PLATE 86. a, ?QUERCUS PEDUNCULARIS. Fruit referred to *Q. tomentosa* by Liebmann. Photographed by permission at Copenhagen. b, QUERCUS LAETA. The type collection (Mexico, *Hartweg*, *419*). Photographed by permission at Dahlem.

PLATE 87. QUERCUS LAETA HETEROPHYLLA. The type (Mexico, *Bourgeau*). Photographed for Monsieur Lecomte at Paris.

PLATE 88. QUERCUS OBSCURA. The type collection (Mexico, *Seemann*, *1971*). Photographed by permission: a, at Kew; b, at Copenhagen.

PLATE 89. a, QUERCUS OBSCURA PERPUSILLA (Mexico, *Seemann*, *1976*). Photographed by permission at Kew. b, QUERCUS TRANSMONTANA. The type (Mexico, *Pringle*, *4116*). Photographed by permission at Dahlem.

PLATE 90. QUERCUS VELLIFERA. The type (Mexico, *Palmer*, 1891). Photographed by permission at Washington.

PLATE 91. QUERCUS DURANGENSIS. a, The type (Mexico, *Matthews*); photographed at St. Louis. b, A fruiting specimen (Mexico, *Nelson*, *5002*). Photographed by permission at Washington.

PLATE 92. QUERCUS DIVERSICOLOR. a, The type (Mexico, *Pringle*, *2021*). b, An Arizona specimen (*Blumer*, *1309*). Both photographed by permission at Dahlem.

PLATE 93. QUERCUS DIVERSICOLOR. Flowering and fruiting specimens from Arizona: a, *Pringle*, 1884; b, *Blumer, 1294*). Both photographed by permission at Dahlem.

PLATE 94. QUERCUS DIVERSICOLOR MEARNSII. The type sheet, reduced, and a part of the type in natural size. (International boundary, *Mearns, 2230*). Photographed by permission at New York.

PLATE 95. QUERCUS RHODOPHLEBIA. The type (Mexico, *Rose, 2806*). b, QUERCUS RHODOPHLEBIA CONCAVA. The type (Mexico, *Rose, 2998*). Both photographed by permission at Washington.

PLATE 96. a, QUERCUS RHODOPHLEBIA APPLANATA. The type, Mexico, *Rose, 2735*). b, QUERCUS RHODOPHLEBIA APUS. The type (Mexico, *Rose, 2721*). Both photographed by permission at Washington.

PLATE 97. a, QUERCUS RHODOPHLEBIA INCLUSA. The type (Mexico, *Rose, 3726*). Photographed by permission at Washington. b, QUERCUS ARIAEFOLIA. The type (Mexico, *Palmer, 82*). Photographed at St. Louis.

PLATE 98. a, QUERCUS RETICULATA. The type collection (Mexico, *Bonpland, 4408*). Photographed by permission at Dahlem. b, QUERCUS RETICULATA DUGESI. The type (Mexico, *Dugès, 5*). Photographed by permission at Washington.

PLATE 99. a, QUERCUS RETICULATA LONGA. The type (Mexico, *Ehrenberg, 897*). b, QUERCUS RETICULATA SQUARROSA. The type (Mexico, *Ehrenberg*). Both photographed by permission at Dahlem.

PLATE 100. QUERCUS UHDEANA. The type (Mexico, *Uhde, 276*). Photographed by permission at Dahlem.

PLATE 101. QUERCUS RUGOSA. a, Sketch of the type made for Professor Lange at Madrid; photographed by permission at Copenhagen. b, The type collection of *Q. spicata* (Mexico, *Bonpland, 4061*). Photographed by permission at Dahlem.

PLATE 102. QUERCUS RUGOSA. The type of *Q. spicata* (Mexico, *Bonpland, 4061*). Photographed for M. Lecomte at Paris.

PLATE 103. QUERCUS BONPLANDIANA. The type of *Q. ambigua* Humboldt and Bonpland (Mexico, *Bonpland, 4162*). Photographed for M. Lecomte at Paris.

PLATE 104. QUERCUS ALVAREZENSIS. The type (Mexico, *Palmer, 69*). Photographed at St. Louis.

PLATE 105. QUERCUS PURPUSI. The type (Mexico, *Purpus, 1794*). Photographed at St. Louis.

PLATE 106. a, QUERCUS CONGLOMERATA. The type (Mexico, *Hartweg, 429*). Photographed by permission at Dahlem. b, QUERCUS DECIPIENS. The type collection (Mexico, *Galeotti, 131*). Photographed by permission in the Delessert herbarium at Geneva.

PLATE 107. QUERCUS DECIPIENS. The type (Mexico, *Galeotti, 131*). Photographed for Professor Bommer at Brussels.

PLATE 108. QUERCUS INNUNCUPATA. The type (Mexico, *Arsène*). Photographed by permission at the Field Museum, Chicago (sheet *416,692*).

PLATE 109. QUERCUS GREGGII. The type collection of *Q. reticulata Greggii* (Mexico, *Gregg, 380*). Photographed at St. Louis.

PLATE 110. a, QUERCUS ACULCINGENSIS. The types of *Q. reticulata crassifolia* (Mexico, *Liebmann, 151*). Photographed by permission at Copenhagen. b, QUERCUS LOESENERI. The type (Mexico, *Pringle, 10120*). Photographed by permission at Dahlem.

PLATE 111. QUERCUS REVOLUTA. The type (Mexico, *Pringle, 8966*). Photographed by permission at Dahlem.

PLATE 112. QUERCUS REVOLUTA DYSOPHYLLOPSIS. The type (Mexico, *Berlandier, 411*). Photographed by permission in the Candollean herbarium at Geneva.

PLATE 113. QUERCUS DESERTICOLA. Type material (Mexico, *Uhde, 305, 309*). Photographed by permission at Dahlem.

PLATE 114. a, QUERCUS DESERTICOLA INCISA. The type (Mexico, *Uhde, 265*). Photographed by permission at Dahlem. b, QUERCUS ALVEOLATA. The type (Mexico, *Purpus, 4091*). Photographed at New York.

PLATE 115. QUERCUS LECOMTEANA. The type (Mexico, *Hahn* 1866). Photographed for M. Lecomte at Paris.

PLATE 116. a, QUERCUS MANZANILLANA. The type (Mexico, *Arsène, 5925*). Photographed by permission at Washington. b, QUERCUS VALLICOLA. The type (Mexico, *Uhde, 296*). Photographed by permission at Dahlem.

PLATE 117. a, QUERCUS TEXCOCANA. The type (Mexico, *Endlich, 653*). b, QUERCUS TEXCOCANA AMPLA. The type (Mexico, *Endlich, 655*). Both photographed by permission at Dahlem.

PLATE 118. QUERCUS SUBTRILOBA. The type (Mexico, *Pringle, 10303*). Photographed by permission at Washington.

PLATE 119. QUERCUS MICROPHYLLA. a, Sketch of the type made for Professor Lange at Madrid. Photographed by permission at Copenhagen. b, A specimen from the Mexican table-land (*Ehrenberg, 924*). Photographed by permission at Dahlem.

PLATE 120. QUERCUS FRUTEX. Two specimens, representative of *Q. nana* Fournier in herb, collected by Bourgeau (a, *no. 68;* b, *no. 1010*).

PLATE 121. QUERCUS REPANDA. The type collection (Mexico, *Bonpland, 4081*). Photographed by permission at Dahlem.

PLATE 122. a, QUERCUS REPANDA. A large leaved form (Mexico, *Ehrenberg, f.*). b, QUERCUS ALPESCENS. The type (Mexico, *Ehrenberg, 1093*). Both photographed by permission at Dahlem.

PLATE 123. QUERCUS POTOSINA. The type (Mexico, *Parry & Palmer, 838*). Photographed at St. Louis.

PLATE 124. QUERCUS POTOSINA EXILIS. The type (Mexico, *Parry & Palmer*, Y). a, Photographed at St. Louis; b, as *838*, photographed at Kew.

PLATE 125. a, QUERCUS POTOSINA APERTA. The type (Mexico, *Parry & Palmer*, *838b*). Photographed at St. Louis. b, QUERCUS CORDIFOLIA. The type (Mexico, *Palmer*, *1278*). Photographed by permission in the Gray herbarium at Cambridge.

PLATE 126. QUERCUS INTRICATA. a, The type collection of Q. *microphylla crispata* (Mexico, *Gregg*, *296*). b, A flowering specimen (Mexico, *Pringle*, *3701*). Both photographed by permission at Dahlem.

PLATE 127. a, QUERCUS INTRICATA. A fruiting specimen (Mexico, *Palmer*, *746* in part). Photographed by permission at New York. b, QUERCUS INTRICATA ANGUSTA. The type (Mexico, *Pringle*, *13286*). Photographed by permission at Washington.

PLATE 128. a, QUERCUS INTRICATA OVATA. The type (Mexico, *Palmer*, *746* in part). b, QUERCUS INTRICATA ERRATICA. The type (Mexico. *Pringle*, *2862*). Both photographed at St. Louis.

PLATE 129. QUERCUS CHIHUAHUENSIS. The type collections (Mexico, *Pringle:* a, *no. 74;* b, *no. 355*). Photographed by permission at Dahlem.

PLATE 130. a, QUERCUS CHIHUAHUENSIS. The type (Mexico, *Pringle*, *970*). Photographed at St. Louis. b, QUERCUS CHIHUAHUENSIS MICROPHYLLOIDES. The type (Mexico, *Schumann*, *1310* in part). Photographed by permission at Dahlem.

PLATE 131. a, QUERCUS CHIHUAHUENSIS TENUIS. The type (Mexico, *Schumann*, *1300* in part). b. QUERCUS CHIHUAHUENSIS AMPLIFOLIA. The type (Mexico, *Schumann*, *1313*). Both photographed by permission at Dahlem.

PLATE 132. QUERCUS JALISCENSIS. The type (Mexico, *Rose*, *2685*). Photographed by permission at Washington.

PLATE 133. QUERCUS JARALENSIS. The type (Mexico, *Schumann*, *1316*). Photographed by permission at Dahlem.

PLATE 134. QUERCUS JARALENSIS. a, Flowering specimen with the type (Mexico, *Schumann*, *1316*); photographed by permission at Dahlem. b, QUERCUS JARALENSIS BERLANDIERI. The type (Mexico, *Berlandier*, *1285*). Photographed by permission in the Gray herbarium at Cambridge.

PLATE 135. QUERCUS UNDATA. The type (Mexico, *Endlich*, *1*). Photographed by permission at Dahlem.

PLATE 136. QUERCUS INFRALUTEA. The type (*Rose*, *Standley & Russell*, *12788*). Photographed by permission at Washington.

PLATE 137. QUERCUS INVAGINATA. Fruit of the type (Mexico, *Purpus*, *5029*). Photographed by permission at Dahlem.

PLATE 138. a, QUERCUS INVAGINATA. The type (Mexico, *Purpus*, *5029*). b, QUERCUS INVAGINATA PURPUSIANA. The type (Mexico, *Purpus*, *5030*). Both photographed by permission at Dahlem.

PLATE 139. QUERCUS PRAECO. The type (Mexico, *Rose*, *2590*), Photographed by permission at Washington.

PLATE 140. QUERCUS CONVALLATA. The type (Mexico, *Diguet*). Photographed for M. Lecomte at Paris.

PLATE 141. a, QUERCUS ARIZONICA. A topotype (Arizona, *Wilcox*, 1894). Photographed by permission at New York. b, QUERCUS PALLESCENS. The type (Mexico, *Rose*, *2960*). Photographed by permission at Washington.

PLATE 142. QUERCUS SACAME. The type (Mexico: a, *Endlich*, *1282:* b, *Endlich*, *1282a*). Photographed by permission at Dahlem.

PLATE 143. a, QUERCUS BIPEDALIS. The type (Mexico, *Rose*, 1897). Photographed by permission at Washington. b, QUERCUS MOHRIANA. The type (Texas, *Buckley*). Photographed by permission at New York.

PLATE 144. a, QUERCUS DEPRESSIPES. The type (Mexico, *Endlich*, *3* in part). Photographed by permission at Dahlem. b, QUERCUS ENGELMANNI. A representative specimen (California, *Sherfee*).

PLATE 145. QUERCUS OBLONGIFOLIA. a, The type ("Western New Mexico," *Woodhouse*). Photographed by permission in the Torrey herbarium at New York. b, A flowering specimen (Mexico, *Endlich*, *1283*. Photographed by permission at Dahlem.

PLATE 146. a, QUERCUS OBLONGIFOLIA. The toothed form of foliage (Mexico, *Hartman*, *363*). Photographed by permission at Kew. b, QUERCUS OBLONGIFOLIA PALLIDINERVIS. The type (Mexico, *Nelson*, *6309*). Photographed by permission at Washington.

PLATE 147. QUERCUS PERPALLIDA. The type (Mexico, *Rose*, *Standley & Russell*, *13089*). Photographed by permission at Washington.

PLATE 148. a, QUERCUS PRINGLEI. The type (Mexico, *Pringle*, *2382*). Photographed by permission at Dahlem b, QUERCUS OPACA. The type (Mexico, *Rose*, *Painter & Rose*, *9030*). Photographed by permission at Washington.

PLATE 149. a, QUERCUS SEBIFERA. The type (Mexico, *Cook*, *79*). b, QUERCUS SEBIFERA COMITANENSIS. The type (Mexico, *Cook*, *78*). Both photographed by permission at Washington.

PLATE 150. a, QUERCUS SCHENCKIANA. The type (Mexico, *Schenck*, *238*). b, QUERCUS CERIPES. The type (Mexico, *Schenck*, *239*). Both photographed by permission at Dahlem.

PLATE 151. QUERCUS STRIATULA. The type (Mexico, *Endlich*, *3* in part). Photographed by permission at Dahlem.

PLATE 152. a, QUERCUS STRIATULA OTINAPENSIS. The type (Mexico, *Palmer*, *445*). Photographed by permission at Cambridge. b, QUERCUS GRISEA. The type collection (Texas, *Wright*, *665*). Photographed by permission in the Candollean herbarium at Geneva.

PLATE 153. a, QUERCUS TOUMEYI. The type (Arizona, *Toumey*). Photographed by permission in the herbarium of the Arnold Arboretum at Jamaica Plain. b, QUERCUS SUBTURBINELLA. The type (New Mexico, *Greene*, 1889). Photographed by permission of Professor Greene, in his herbarium, now at Notre Dame University.

PLATE 154. QUERCUS HARTMANI. a, The type (Mexico, *Hartman, 633*). Photographed by permission at Dahlem. b, A fruiting specimen (Mexico, *Goldman, 1421*). Photographed by permission at Washington.

PLATE 155. a, QUERCUS RYDBERGIANA. The type (New Mexico, *Cockerell*, 1902). Photographed by permission at New York. b, QUERCUS UNDULATA. The type ("Rocky Mountains," *James*). Photographed by permission in the Torrey herbarium at New York.

PLATE 156. QUERCUS UNDULATA VASEYANA. a, The type (Texas, *Buckley*). b, A small-fruited farm (Texas, *Bigelow*). Both photographed by permission at New York.

PLATE 157. QUERCUS UNDULATA FUNGENS. a, The type of *Q. pungens* Liebmann (Texas, *Wright, 664*, from the Hookerian herbarium). Photographed by permission at New York. b, A deeply incised specimen. (Mexico, *Pringle, 172*). Photographed by permission at Dahlem.

PLATE 158. 1, QUERCUS VENUSTULA. From the type figure (Greene, pl. 32). 2, QUERCUS GAMBELII. A topotype (New Mexico, *Heller, 3614*). 3, QUERCUS UTAHENSIS. After Rydberg (pl. 25).

PLATE 159. QUERCUS FENDLERI. The type (New Mexico, *Fendler, 805*). Photographed for the director, at Kew.

PLATE 160. a, QUERCUS HAVARDI. The type (Texas, *Havard*); photographed by permission at St. Louis. b, QUERCUS PAUCILOBA. A cotype (Arizona, *MacDougal*); photographed by permission at New York.

PLATE 161. a, QUERCUS CONFUSA. The type (New Mexico, *Wooton, 69125*). b, QUERDUS MEDIA.(New Mexico, *Howell, 178*). Both photographed by permission at Washington.

PLATE 162. a, QUERCUS OBTUSIFOLIA. The type collection (New Mexico, *Fendler, 807*). b, QUERCUS EASTWOODIAE. The type (Utah, *Eastwood, 14*). Both photographed by permission at New York.

PLATE 163. a, QUERCUS SUBMOLLIS. The type (Arizona, *Wilcox*). b, QUERCUS LEPTOPHYLLA. The type (Colorado, *Rydberg & Vreeland, 6347*). Both photographed by permission at New York.

PLATE 164. a, QUERCUS NITESCENS. The type (Colorado, *Vreeland, 677*). Photographed by permission at New York. b, QUERCUS NOVOMEXICANA ANDREWSII. The type (Colorado, *Andrews*). Photographed at the University of Illinois.

PLATE 165. QUERCUS NOVOMEXICANA. The type, as of *Q. Gambellii* Liebmann (Rio del Norte, *Nuttall*). Photographed for the Director in the Hookerian herbarium at Kew.

PLATE 166. a, QUERCUS GUNNISONII. The type, as of *Q. alba Gunnisonii* (Colorado, *Crentzfeldt*). b, QUERCUS VREELANDII. The type (Colorado, *Vreeland, 685*). Both photographed by permission at New York.

PLATE 167. QUERCUS GARRYANA. The type of *Q. Neaei* (California, *Hartweg, 1965*). Photographed for the Director, at Kew.

PLATE 168. QUERCUS. *The Lobatae:* 1, Q. LOBATA. The type (California, after a sketch by Lange). 2, Q. GARRYANA. A rather large leaf (Sargent, pl. 364). 3, Q. OERSTEDIANA. (From the figures of Greene, pl. 10, and Sargent, pl. 363.)

PLATE 169. QUERCUS. *The Durandieae:* 1, Q. SINUATA DURANDII. Several leaf forms (Louisiana, *Sterrett*). 2, Q. BREVILOBA. From the type locality (Texas, *Simonds*).

PLATE 170. a, QUERCUS SINUATA. The type of *Q. austrina* (Alabama, *Mohr*). Photographed by permission at New York. b, QUERCUS BREVILOBA ARGENTATA. The type (Texas, *Havard, 54*). Photographed by permission at St. Louis.

PLATE 171. a, QUERCUS SINUATA DURANDII. (Mexico, *Berlandier, 1400*). Photographed by permission in the Candollean herbarium at Geneva. b, QUERCUS SILLAE. The type (Mexico, *Pringle, 11332*). Photographed by permission in the U. S. National herbarium.

PLATE 172. QUERCUS ALBA: 1, f. TYPICA (*Q. alba pinnatifida*, after Michaux, pl. 5). 2, f. RYDERI. The type (Carmel, N. Y., *Ryder*, 1905). 3, f. HETEROPHYLLA (after Britton).

PLATE 173. QUERCUS ALBA: 1, f. LATILOBA (*Q. alba* Auct., Illinois, *Trelease*). 2, f. SUBLYRATA. The type (Mississippi, *Sterrett, 11*). 3, f. REPANDA (after Michaux, pl. 5).

PLATE 174. QUERCUS ALBA: 1, f. SUBLYRATA. The type (Mississippi, *Sterrett, 11*). 2, f. HETEROPHYLLA. One of the series figured on the next plate.

PLATE 175. QUERCUS ALBA HETEROPHYLLA. A series of leaves from one tree (Michigan, *Alexander*).

PLATE 176. QUERCUS. *The Stellatae:* 1–2, Q. MARGARETTA. Representative leaves (Alabama, *Peltier*). 3, Q. BOYNTONI. The type (Alabama, *Biltmore herbarium, 1905a*). 4, Q. CHAPMANI. (Florida, *Curtis, 6010.*)

PLATE 177. QUERCUS STELLATA: 1, f. ANOMALA. The type (Texas, *Palmer, 13037*). 2, f. RUFESCENS. The type (Texas, *Palmer, 12462*). 3, f. PARVILOBA. The type (Texas, *Palmer, 11105*). 4, f. CRUCIFORMIS. The type (Texas, *Lacey*).

PLATE 178. QUERCUS STELLATA: 1, f. ATTENUATA (Arkansas, *Kellogg*, 1909). 2, f. PALMERI (Oklahoma, *Palmer, 12564*). 3, f. PALUDOSA (Louisiana, *Cocks, 4734*).

PLATE 179. QUERCUS STELLATA: 1, A representative though narrow-sinused leaf (Arkansas, *Sterrett, 10*). 2, A variant with bilobed lobes (Illinois, *Wright, 17*). 3, f. OBLONGA. The type (Arkansas, *Sterrett, 8*).

PLATE 180. QUERCUS STELLATA: 1, f. QUADRATA. The type (North Carolina, *Totten*, 1916). 2, f. STERRETTI. The type (Mississippi, *Sterrett, 15*).

PLATE 181. QUERCUS STELLATA. The type of *Q. Drummondii* (Texas, *Drummond, 542 bis*). Photographed for the director, at Kew.

PLATE 182. QUERCUS STELLATA. The type collection of *Q. floridana* (Florida, *Rugel*). Photographed by permission at St. Louis.

PLATE 183. QUERCUS LYRATA: 1, A normally shaped leaf of the green variant (Arkansas, *Sterrett*, 7). 2, A less typically shaped leaf of the usual silvery form (Arkansas, *Sterrett*, 4).

PLATE 184. QUERCUS MACROCARPA: 1, A leaf of the common type (Iowa, *Lazell*, 1916); 2, f. ORBICULATA. The type (Illinois, *Chase*, *924*).

PLATE 185. QUERCUS MACROCARPA. A leaf of the more dissected type, and a less-lobed leaf from the same tree. (Illinois, *Trelease*.)

PLATE 186. QUERCUS BICOLOR. Two leaves differing in degree of lobing. (1, Maryland, *Holm*, 1911; 2, Connecticut, *Eames*, 1893).

PLATE 187. QUERCUS. *The Prinoideae:* 1, Q. MONTANA (*Q. Prinus* Auct.); 2, Q. MUEHLENBERGII; 3, Q. PRINOIDES; 4, Q. PRINUS (*Q. Michauxii* Auct.). All after Sargent (pl. 376, 377, 378, 383).

PLATE 188. QUERCUS. *The Douglasieae* and *Sadlerianae:* 1, Q. DOUGLASII. Leaf range (Sargent, pl. 386). 2, Q. SADLERIANA (Sargent, pl. 386).

PLATE 189. a, QUERCUS VIRGINIANA. A representative specimen (Virginia, *Vasey*, 1879). b, QUERCUS VIRGINIANA SAGRAEANA. A representative specimen (Cuba, *Shafer & Leon*, *13676*). Photographed by permission at New York.

PLATE 190. a, QUERCUS VIRGINIANA MACROPHYLLA. The type (Texas, *Palmer*, *1079*); b, QUERCUS VIRGINIANA VIRESCENS. The type (Florida, *Harbison*, *48*). Both photographed by permission from Arnold Arboretum material.

PLATE 191. QUERCUS OLEOIDES. The type (Mexico, *Schiede*, *23*). Photographed by permission at Dahlem.

PLATE 192. a, QUERCUS OLEOIDES. Characteristic fruit (Mexico, *Liebmann*). b, QUERCUS OLEOIDES AUSTRALIS. A small-leaved specimen (Costa Rica, *Oersted*, *4*, the type of *Q. retusa* Liebmann). Both photographed by permission at Copenhagen.

PLATE 193. QUERCUS OLEOIDES AUSTRALIS. The type (Costa Rica, *Pittier*, *2607*). Photographed for Professor Bommer at Brussels.

PLATE 194. QUERCUS OLEOIDES LUTESCENS. The type (Mexico, *Galeotti*, *91*). Photographed for Professor Bommer at Brussels.

PLATE 195. QUERCUS FUSIFORMIS. a, The type (Texas, *Lacey*); b, (Mexico, *Palmer*, *299*). Both photographed by permission at New York.

PLATE 196. QUERCUS BRANDEGEI. The type (Baja California, *Nelson & Goldman*, *7422*). Photographed by permission at Washington.

PLATE 197. QUERCUS BRANDEGEI. Two collections with characteristic fruit (Baja California; a, *Vaslit*, 1895; b, *Brandegee*, 1893). Photographed by permission at the Arnold Arboretum.

PLATE 198. a, QUERCUS GEMINATA MARITIMA. A representative specimen (Mississippi, *Lloyd & Tracey*, *2*). Photographed by permission at New York. b, QUERCUS GEMINATA GRANDIFOLIA. The type (Florida, *Harbison*, *4*). Photographed by permission from Arnold Arboretum material.

PLATE 199. QUERCUS GEMINATA SUCCULENTA. a, The type (Florida, *Small*); b, A cotype of *Q. virens spicata* Chapman *ined.* (Florida, *Chapman*). Both photographed by permission at New York.

PLATE 200. a, QUERCUS GEMINATA ROLFSII. The type, as of *Q. Rolfsii* (Florida, *Small & Carter*, *1244*); Photographed by permission at New York. b, QUERCUS MINIMA REASONERI. The type (Florida, *Reasoner*, *405*); Photographed by permission from the material at Chapel Hill, North Carolina.

PLATE 201. a, QUERCUS MINIMA. Cotype, as of *Q. virens dentata* (Florida, *Chapman*). Photographed by permission at New York. b, QUERCUS MINIMA PYGMAEA. The type of *Q. virginiana pygmaea* (Florida, *Baker*, 1915). Photographed by permission of the Arnold Arboretum.

PLATE 202. a, QUERCUS ANDROMEDA. The type of *Q. virginiana eximea* (Louisiana, *Cocks*, *4716*). Photographed by permission of the Arnold Arboretum. b, QUERCUS ANDROMEDA NANA The type (Florida, *Small*, 1916).

PLATE 203. a, QUERCUS DUMOSA MACDONALDI. A specimen representing one of the most lobed forms of the polymorphic species. (California, *Grant*, *1091*). Photographed by permission in the Field Museum at Chicago. b, QUERCUS DUMOSA MICROCARPA. The type (Baja California, *Palmer*, *640*). Photographed by permission in the Engelmann herbarium at St. Louis.

PLATE 204. a, QUERCUS DUMOSA ACUTIDENS. The type, as of *Q. acutidens* (California, *Parry*). Photographed by permission in the Torrey herbarium at New York. b, QUERCUS DUMOSA POPULIFOLIA. The type (Baja California, *Brandegee*, 1893). Photographed by permission at the Arnold Arboretum.

PLATE 205. a, QUERCUS DUMOSA DIVERSIFOLIA. The type (Baja California, *Brandegee*, 1893); b, QUERCUS DUMOSA LINEARIS. The type (Baja California, *Brandegee*, 1893). Both photographed by permission of the Arnold Arboretum.

PLATE 206. QUERCUS DUMOSA TURBINELLA. The type, as of *Q. turbinella* (California, *Greene*). Photographed for Professor Niewland in the Greene herbarium at Notre Dame University.

PLATE 207. QUERCUS DUMOSA BERBERIDIFOLIA. A typical specimen (California, *Frémont Expedition*, 1843–4). Photographed for the Director at Kew.

PLATE 208. a, QUERCUS DUMOSA BERBERIDIFOLIA. The type, as of *Q. berberidifolia* (California, *Coulter*, *661*). Photographed for the Director in the Hookerian herbarium at Kew. b, QUERCUS DUMOSA CRISPATA. The type (Baja California, *Palmer*, *29*). Photographed by permission at St. Louis.

PLATE 209. QUERCUS CHRYSOLEPIS. Thetype of *Q. parvifolia* Benth. (California, *Hartweg*, *426*). Photographed for the Director at Kew.

PLATE 210. a, QUERCUS CHRYSOLEPIS. A representative large-fruited specimen (California, *Scherfee*, 1914). b, QUERCUS VACCINIFOLIA. A representative specimen (California, *Schneck*, 1901). Both photographed at Urbana.

PLATE 211. QUERCUS TOMENTELLA. Two representative specimens from Guadalupe Island (a, *Brown*, 1906; b, *Rose, 16013*). Both photographed by permission in the U. S. National herbarium at Washington.

PLATE 212. QUERCUS TOMENTELLA. The larger, more dentate form of foliage, from Guadalupe Island (a, the type of the species, *Palmer, 89;* b, *Franceschi*). The former photographed in the Engelmann herbarium at St. Louis, and the latter in New York.

PLATE 213. QUERCUS PALMERI, showing the foliage variability, from Baja California (a, *Orcutt*, 1885; b, *Brandegee*, 1893). The former photographed by permission in the Gray herbarium at Cambridge, and the latter at the Arnold Arboretum.

PLATE 214. QUERCUS PALMERI, from Baja California (a, *Dunn*, the type of *Q. Dunnii;* b, *Orcutt*, 1885). Photographed by permission, the former in the Greene herbarium, now at Notre Dame University; the latter at New York.

PLATE 215. QUERCUS WILCOXII, from Arizona (a, *Wilcox*, 1892; b, *Wilcox*, 1894). Both photographed by permission at New York.

PLATE 216. QUERCUS EMORYI. a, The type (Texas, *Emory* 1846). Photographed by permission in the Torrey herbarium at New York. b, A fruiting specimen (Arizona, *Toumey*, sheet *39550*). Photographed by permission at Washington.

PLATE 217. QUERCUS EMORYI. The type of *Q. hastata* (Texas, *Wright, 666*). Photographed for the Director at Kew.

PLATE 218. a, QUERCUS DURIFOLIA. The type (Mexico, *Palmer, 771*). Photographed by permission at Dahlem. b, QUERCUS NITIDISSIMA. The type (Mexico, *Rose, Painter & Rose, 9720*). Photographed by permission at Washington.

PLATE 219. a, QUERCUS EDUARDI. The type (Mexico, *Palmer, 956*). b, QUERCUS EDUARDI CESPITIFERA. The type (Mexico, *Schumann, 1311*). Both photographed by permission at Dahlem.

PLATE 220. a, QUERCUS BALSEQUILLANA. The type (Mexico, *Endlich, 1278*). b, QUERCUS DURAZNILLO. The type (Mexico, *Endlich, 1277b*). Both photographed by permission at Dahlem.

PLATE 221. QUERCUS DURAZNILLO BULLATA. The type (Mexico, *Endlich, 1277a*). Photographed by permission at Dahlem. b, QUERCUS DURAZNILLO PINETORUM. The type (Mexico, *Hartman, 131*). Photographed by permission in the Gray herbarium at Cambridge.

PLATE 222. QUERCUS VIMINEA. a, The type (Mexico, *Endlich, 790c*). Photographed by permission at Dahlem. b, Another collection (Mexico, *Hartman, 342*). Photographed by permission at New York.

PLATE 223. QUERCUS BOLANYOSENSIS. The type (Mexico, *Rose, 2958*). Photographed by permission at Washington.

PLATE 224. QUERCUS DEVIA. a, The type (*Nelson & Goldman, 7454*); b, Another collection (*Nelson & Goldman, 7471*). Both from Baja California. Photographed by permission in Washington.

PLATE 225. QUERCUS PENINSULARIS. a, The type (*Brandegee*); b, Another collection (*Brandegee*). Both from Baja California. Photographed by permission at the Arnold Arboretum.

PLATE 226. QUERCUS HYPOLEUCA. a, The type (Arizona, *Schott*, as *Q. confertifolia* Torrey); b, A collection with clearly annual fruit (Arizona, *Pringle*, 1881). Both photographed by permission at New York,

PLATE 227. QUERCUS SCYTOPHYLLA. The type (Mexico, *Liebmann, 144-5=3557*). Photographed by permission at Copenhagen.

PLATE 228. QUERCUS CAMPANARIENSIS. The type (Mexico, *Arsène, 6004 bis*). Photographed by permission at Washington.

PLATE 229. a, QUERCUS EPILEUCA. The type (Mexico, *Hartman, 337*). Photographed by permission at New York. b, QUERCUS INCARNATA AMPLA. The type (Mexico, *Endlich, 782b*). Photographed by permission at Dahlem.

PLATE 230. a, QUERCUS INCARNATA. The type (Mexico, *Endlich, 782b*). b, QUERCUS INCARNATA LONGA. The type (Mexico, *Endlich, 782a*). Both photographed by permission at Dahlem.

PLATE 231. a, QUERCUS INCARNATA GROSSE-SERRATA. The type (Mexico, *Endlich, 782d*). Photographed by permission at Dahlem. b, QUERCUS OMISSA. The type (Mexico, *Seemann, 1969*). Photographed by permission in the Hookerian herbarium at Kew.

PLATE 232. QUERCUS FLOCCOSA. a, The type (Mexico, *Liebmann, 150=3479*). Photographed by permission at Copenhagen. b, A later collection with entire leaves (Mexico, *Seaton, 230*). Photographed by permission at Cambridge.

PLATE 233. QUERCUS ORIZABAE. Type specimens. (Mexico, *Liebmann, 83-84=3539*). Photographed by permission at Copenhagen.

PLATE 234. QUERCUS CRASSIFOLIA. The type collection (Mexico, *Bonpland*). Photographed by permission: a, at Paris; b, at Dahlem.

PLATE 235. QUERCUS FULVA. The type (Mexico, *Seemann, 1973*). Photographed by permission at Copenhagen.

PLATE 236. a, QUERCUS CRASSIFOLIA. A Mexican collection (*Gregg, 638*). Photographed by permission in the Engelmann herbarium at St. Louis; b, QUERCUS FULVA. A Mexican collection (*Ross, 376*). Photographed by permission at Munich.

PLATE 237. QUERCUS FELIPENSIS. The type (Mexico, *Smith, 776*). Photographed at St. Louis.

PLATE 238. QUERCUS BRACHYSTACHYS. The type (Guatemala, *Hartweg, 618*). Photographed by permission in the Benthamian herbarium at Kew.

PLATE 239. QUERCUS BRACHYSTACHYS. a, A flowering specimen (*Smith, 2689*); b, A small-leaved fruiting specimen (*v. Warscewicz, 41–2*). Both from Guatemala. Photographed by permission at Dahlem.

PLATE 240. QUERCUS BRACHYSTACHYS. a, f. VENULOSA. The type (*Trelease, 28*). b, f. CAERULEA. The type (*Trelease, 30*). Both from Guatemala. Photographed at Urbana.

PLATE 241. QUERCUS MORELIANEA. The type (Mexico, *Arsène, 6681*). Photographed by permission at Washington.

PLATE 242. QUERCUS STIPULARIS. The type (Mexico, *Bonpland*). Photographed for M. Lecomte at Paris.

PLATE 243. QUERCUS STIPULARIS. Two collections from Mexico (a, *Hartweg, 424*, the type of *Q. splendens pallidior;* b, *Hartweg, 426*). Both photographed by permission in the Boissier herbarium at Geneva.

PLATE 244. QUERCUS STIPULARIS. Two Mexican collections showing clearly the annual fruit, a, *Galeotti, 114*. Photographed by permission in the Delessert herbarium at Geneva; b, *Ehrenberg, 262*. Photographed by permission at Dahlem.

PLATE 245. QUERCUS ERRANS. a, The type (Mexico, *Hahn, 667*). Photographed by permission at Dahlem; b, A second collection (Mexico, *Hartweg, 424*). Photographed by permission in the Delessert herbarium at Geneva. In both, the fruit is obviously biennial.

PLATE 246. QUERCUS CHICAMOLENSIS. The type, as of *Q. mollis* Mart. & Gal. (Mexico, *Galeotti, 102*). Photographed for Professor Bommer at Brussels.

PLATE 247. QUERCUS HAHNII. The type (Mexico, *Hahn, 347*, as *Q. grandifolia* Fourn.). Photographed by permission at Copenhagen.

PLATE 248. QUERCUS ESPERANZAE. The type (Mexico, *Purpus, 5332*). Photographed by permission at N. Y.

PLATE 249. a, QUERCUS ORBICULATA. The type (Mexico, *Parry & Palmer, 836*, in part); b, QUERCUS MIGUELITENSIS. The type (Mexico, *Parry & Palmer, 897* in part). Both photographed by permission at Cambridge.

PLATE 250. QUERCUS DYSOPHYLLA. The type (Mexico, *Hartweg, 421*). Photographed by permission in the Benthamian herbarium at Kew.

PLATE 251. QUERCUS DYSOPHYLLA. A representative collection (Mexico, *Ehrenberg, 956*). Photographed by permission at Dahlem.

PLATE 252. QUERCUS SPLENDENS. a, A sketch of the type, made at Madrid for Professor Lange; b, What is taken to be *Q. dysophylla*, though comparable with *splendens* (Mexico, *Ehrenberg, 694*). Photographed by permission at Dahlem.

PLATE 253. a, QUERCUS URBANI. The type (Mexico, *Langlassé, 1066*). Photographed by permission at Dahlem. QUERCUS RADIATA. The type (Mexico, *Rose, 2230*). Photographed by permission at Washington.

PLATE 254. QUERCUS CONZATTII. The type sheet (Mexico, *Conzatti, 1900*) reduced, and a fragment of natural size. Photographed by permission in the Field Museum at Chicago.

PLATE 255. QUERCUS TEPICANA. The type (Mexico, *Rose*, 1897). Photographed by permission at Washington.

PLATE 256. QUERCUS PENNIVENIA. a, The type (Mexico, *Seemann, 1978*). Photographed by permission at Kew. b, A later collection (Mexico, *Hartman, 713*). Photographed by permission at Cambridge.

PLATE 257. a, QUERCUS AEREA. The type (Mexico, *Pringle, 1570*). Photographed by permission at Cambridge. b, QUERCUS JONESI. The type (Mexico, *Rose, 3000*). Photographed by permission at Washington.

PLATE 258. QUERCUS COCCOLOBAEFOLIA. The type (Mexico, *Bonpland, 4269*). Photographed by permission at Dahlem.

PLATE 259. QUERCUS PLANIPOCULA. a, The type (Mexico, *Rose, 1970*). b, Another collection (Mexico, *Rose, 1648*). Both photographed by permission at Washington.

PLATE 260. QUERCUS ROSEI. a, The type (Mexico, *Rose, 3458*). b, Another collection (Mexico, *Rose, 3449*). Both photographed by permission at Washington.

PLATE 261. a, QUERCUS COFFEAECOLOR. The type (Mexico, *Rose, 1758*). b, QUERCUS AEQUIVENULOSA. The type (Mexico, *Rose, 2231*). Both photographed by permission at Washington.

PLATE 262. QUERCUS PRAINEANA. The type (Mexico, *Pringle, 8854*). Photographed by permission: a, at Copenhagen; b, at Kew.

PLATE 263. QUERCUS LANGLASSEI. The type (Mexico, *Langlassé, 1006*). Photographed by permission at Dahlem.

PLATE 264. a, QUERCUS CHIQUIHUITILLONIS. The type (Mexico, *Langlassé, 212*). Photographed by permission at Dahlem. b, QUERCUS PRODUCTIPES. The type (Mexico, *Gregg, 977*). Photographed by permission in the Engelmann herbarium at St. Louis.

PLATE 265. QUERCUS ARISTATA. The type (Mexico, *Sinclair*, 1845). Photographed for the Director, in the Hookerian herbarium at Kew.

PLATE 266. a, QUERCUS EXARISTATA. The type (Mexico, *Rose*). b, QUERCUS HONDURENSIS. The type (Honduras, *Thieme, 5440*). Both photographed by permission at Washington.

PLATE 267. QUERCUS ENDLICHIANA. Typical material (Mexico, *Endlich:* a, *no. 1284;* b, *no. 6*, the type). Photographed by permission at Dahlem.

PLATE 268. a, QUERCUS AMPHIOXYS. The type (El Salvador, *Niederlein*, 1898). Photographed by permission at Dahlem. b, QUERCUS ALMAGUERENSIS? Fruit (Colombia, *Wolcott, 1914*); from the New York Botanical Garden.

PLATE 269. QUERCUS ALMAGUERENSIS. The type collection (Colombia, *Bonpland*). Photographed by permission at Dahlem.

PLATE 270. QUERCUS TOLIMENSIS. The type (a) at Paris, and another specimen of the same collection (b) at Dahlem (Colombia, *Bonpland*). Photographed by permission.

PLATE 271. QUERCUS TOLIMENSIS. a, A twig of the type collection with acornlike bud-gall. Photographed by permission at Dahlem. b, A specimen with partly developed fruit (Colombia, *Lehmann*, 1884). Photographed by permission in the Boissier herbarium at Geneva.

PLATE 272. QUERCUS HUMBOLDTII. A characteristic specimen (Colombia, *Hartweg, 1393*). Photographed for Professor Bommer at Brussels.

PLATE 273. a, QUERCUS HUMBOLDTII. A specimen with mature fruit (Colombia, *Stiebel, 323a*). b, QUERCUS HUMBOLDTII LEHMANNIANA. The type (Colombia, *Lehmann, 7453*). Both photographed by permission at Dahlem.

PLATE 274. QUERCUS LINDENI. The type (Colombia, *Linden, 1325*). Photographed by permission in the Boissier herbarium at Geneva.

PLATE 275. QUERCUS RAPURAHUENSIS. The type (Costa Rica, *Tonduz, 11796*). Photographed for Professor Bommer at Brussels.

PLATE 276. QUERCUS URUAPANENSIS. The type, as of *Q. nitida* Mart. & Gal. (Mexico, *Galeotti, 121*). Photographed for Professor Bommer at Brussels.

PLATE 277. a, QUERCUS URUAPANENSIS (Mexico, *Pringle, 8840*). Collection from the type locality. Photographed by permission at Copenhagen. b, QUERCUS TRINITATIS. The type (Mexico, *Pringle, 8888*). Photographed by permission at Budapest.

PLATE 278. QUERCUS IRAZUENSIS. a, The type sheet, reduced (Costa Rica, *Kuntze, 2344*). Photographed by permission at New York. b, A cotype. Photographed by permission at Kew.

PLATE 279. QUERCUS RYSOPHYLLA. a, The type (Mexico, *Pringle, 10225*). b, Another collection from the same region (*Pringle, 10379*). Both photographed by permission in the Gray herbarium at Cambridge.

PLATE 280. QUERCUS ENDRESI. The type (Costa Rica, *Endres*). Photographed by permission at Vienna.

PLATE 281. QUERCUS COSTARICENSIS. The type (Costa Rica, *Oersted, 3465*). Photographed by permission at Copenhagen.

PLATE 282. QUERCUS COSTARICENSIS. a, Flowering specimen (Costa Rica, *Pittier, 871*). b, A specimen with mature fruit (Costa Rica, *v. Warscewicz, 53*). Both photographed by permission at Dahlem.

PLATE 283. QUERCUS COSTARICENSIS KUNTZEI. a, A representative specimen (Costa Rica, *Oersted, 3465* in part). Photographed by permission at Copenhagen. b, The type (Costa Rica, *Kuntze, 2282*). Photographed by permission at New York.

PLATE 284. QUERCUS BENTHAMI. The type collection (Guatemala, *Hartweg, 563*). Photographed by permission: a, at Dahlem; b, in the Delessert herbarium at Geneva.

PLATE 285. QUERCUS TONDUZII. The type (Costa Rica, *Tonduz, 10788*). Photographed for Professor Bommer at Brussels.

PLATE 286. QUERCUS CRISPIFOLIA. The type (Mexico, *Reeves, 4*). Photographed in the herbarium of the University of Illinois.

PLATE 287. QUERCUS INCRASSATA. The type (Mexico, *Reeves, 7*). Photographed at the University of Illinois.

PLATE 288. QUERCUS CITRIFOLIA. The type (Costa Rica, *Oersted, 6=3461*). Photographed by permission at Copenhagen.

PLATE 289. QUERCUS NECTANDRAEFOLIA. a, The type (Mexico, *Liebmann, 100=3509*). b, Typical fruit (Mexico, *Liebmann*). Both photographed by permission at Copenhagen.

PLATE 290. QUERCUS LINGVAEFOLIA. The type (Mexico, *Liebmann, 102=3506*). Photographed by permission at Copenhagen.

PLATE 291. a, QUERCUS SAPOTAEFOLIA. The type (Costa Rica, *Skinner, 6*). Photographed by permission in the Hookerian herbarium at Kew. b, QUERCUS BUMELIOIDES. The type (Panama, *Seemann*, 1849). Photographed by permission in the Hookerian herbarium at Kew.

PLATE 292. QUERCUS PERSEAEFOLIA. a, The type (Mexico, *Liebmann, 98=3476*). b, A twig with partly developed fruit (Mexico, *Ghiesbreght, 119*). Photographed by permission at Kew.

PLATE 293. QUERCUS PERSEAEFOLIA. A fruiting specimen (Mexico, *Ghiesbreght, 118*). Photographed for M. Lecomte at Paris.

PLATE 294. a, QUERCUS PUBINERVIS. The type collection (Mexico, *Galeotti, 4*). Photographed by permission at Dahlem. b, QUERCUS OAJACANA. The type collection (Mexico, *Galeotti, 108*). Photographed by permission at Kew.

PLATE 295. QUERCUS BOTRYOCARPA. The type (Mexico, *Rose, 1971*). Photographed by permission at Washington.

PLATE 296. QUERCUS SYNTHETICA CRENIFOLIA. The type (Mexico, *Ghiesbreght, 117*). Photographed for M. Lecomte at Paris.

PLATE 297. a, QUERCUS SYNTHETICA. The type (Mexico, *Ghiesbreght, 121*). b, QUERCUS TOTUTLENSIS. The type (Mexico, *Liebmann, 3568*). Both photographed by permission at Copenhagen.

PLATE 298. QUERCUS PARVIGLANS. The type collection of *Q. microcarpa* Liebm. (Guatemala, *v. Warscewicz, 8*). Photographed by permission: a, in the Boissier herbarium at Geneva; b, at Dahlem.

PLATE 299. a, QUERCUS PARVIGLANS POLYCARPA. The type (Guatemala, *Cook, 291*). Photographed by permission at Washington. b, QUERCUS GEMMATA. The type (El Salvador, *Niederlein*). Photographed by permission at Dahlem.

PLATE 300. a, QUERCUS GUATIMALENSIS. The type (Guatemala, *v. Warscewicz, 57*). Photographed by permission at Dahlem. b, QUERCUS CORREPTA. The type, as of *Q. acutifolia microcarpa* (Guatemala, *v. Warscewicz, 25*). Photographed by permission in the Boissier herbarium at Geneva.

PLATE 301. QUERCUS SALICIFOLIA. a, A sketch of the type made at Madrid by Professor Lange. b, The type collection of *Q. mexicana glabrata* and *Q. castanea glabrata* (Mexico, *Seemann*). Both photographed by permission at Copenhagen.

PLATE 302. a, QUERCUS ACAFULCENSIS. The type (Mexico, *Palmer, 334*). Photographed by permission at Cambridge. b, QUERCUS TAHUASALANA. The type (Mexico, *Langlassé, 211*). Photographed by permission at Dahlem.

PLATE 303. QUERCUS. *The Laurifoliae:* 1, QUERCUS PUMILA (Florida, *Curtiss, 6361*); 2, QUERCUS CINEREA (Florida, *Curtiss, 5608*); 3, QUERCUS CINEREA DENTATO-LOBATA (Florida, *Stewart*, 1916); 4–5, QUERCUS IMBRICARIA (4, Iowa, *Pammel*, 1917; 5, Illinois, *Andrews*, 1893); 6, QUERCUS PHELLOS (Arkansas, *Sterrett, 15*); 7, QUERCUS MYRTIFOLIA (Florida, *Curtiss, 5541*).

PLATE 304. QUERCUS LAURIFOLIA: 1, The typical form (after Michaux, pl. 17); 2, f. OBTUSA (after Michaux, pl. 18); 3, f. RHOMBICA (Louisiana, *Sterrett, 12*); 4, f. TRIDENTATA (Florida, *Harbison, 26*, the type).

PLATE 305. a, QUERCUS LAURIFOLIA RHOMBICA. The type of *Q. rhombica* (Alabama, *Cocks*); b, QUERCUS LAURIFOLIA TRIDENTATA. The type (Florida, *Harbison, 26*). Both photographed by permission from material of the Arnold Arboretum.

PLATE 306. a, QUERCUS LAURIFOLIA DENTATA. The type (Florida, *Reasoner, 503*). Photographed by permission from material in the herbarium at Chapel Hill, N. C. b, QUERCUS LAURIFOLIA OBOVATIFOLIA. The type (Texas, *Palmer, 1274*). Photographed by permission from Arnold Arboretum material.

PLATE 307. QUERCUS. *The Palustres:* 1–3, QUERCUS PALUSTRIS—some leaf-forms from Illinois (1, *Andrews*, 1893; 2, *Brendel*, 1850; 3, *Clinton*, 1899); 4, QUERCUS GEORGIANA (Georgia, *Canby*, 1869).

PLATE 308. QUERCUS NIGRA. 1, An extreme of the spatulately dilated leaf-form (Louisiana, *Sterrett, 4*); the others from one branch of a fairly typical tree (Texas, *Sterrett, 5*).

PLATE 309. QUERCUS NIGRA: 1, f. MICROCARYA, the type of *Q. microcarya* (Georgia, *Small*, 1893); 2, f. SAXICOLA, the type of *Q. saxicola* (Georgia, *Small*, 1893); 3, f. PLENOCARPA, the type of *Q. plenocarpa* (Georgia, *Small*, 1893); 4, f. TRIDENTIFERA, a representative specimen (Mississippi, *Harbison, 19*). The first three photographed by permission in New York; the last, from Arnold Arboretum material.

PLATE 310. QUERCUS NIGRA HEMISPHAERICA. Sheets 1 and 2 of the three sheets representing *Q. hemisphaerica* in Willdenow's herbarium, as *no. 17631*. Photographed by permission at Dahlem (about one-third natural size.)

PLATE 311. QUERCUS NIGRA HEMISPHAERICA. Leaf-forms of one tree (Alabama, *Wolf, 4*).

PLATE 312. QUERCUS NIGRA HEMISPHAERICA. Progressive lobing on two branches (Alabama, *Wolf*—the upper series, *no. 5;* the lower series, *no. 4*).

PLATE 313. QUERCUS NIGRA HEMISPHAERICA. Progressive lobing on a single branch (Alabama, *Wolf, 4*); see the preceding two plates for other leaf-forms of the same tree.

PLATE 314. QUERCUS NIGRA HEMISPHAERICA. The enlarged elongated type of foliage—from a single branch (Florida, *Stewart, b*).

PLATE 315. QUERCUS BORUCASANA. a, The type, as of *Q. granulata* Liebm. (Costa Rica, *Oersted, 5=3491*); photographed by permission at Copenhagen. b, A later collection (Costa Rica, *Pittier, 10553*). Photographed by permission at Dahlem.

PLATE 316. a, QUERCUS EUGENIAEFOLIA. The type (Costa Rica, *v. Warscewicz*, C); b, QUERCUS EUGENIAEFOLIA PETIOLATA. The type (Costa Rica, *Hoffmann, 863*). Both photographed by permission at Dahlem.

PLATE 317. QUERCUS SEEMANNI. a, The type (Panama, *Seemann, 1228*). Photographed by permission in the Hookerian herbarium at Kew. b, Another collection (Panama, *Wagner*, 1858). Photographed by permission at Munich.

PLATE 318. QUERCUS DONNELL-SMITHII. Two variants of the type (Guatemala, *Donnell-Smith, 1967*).

PLATE 319. QUERCUS FLAGELLIFERA. The type (Guatemala, *Cook & Griggs, 607*). Photographed by permission at Washington.

PLATE 320. QUERCUS ACATENANGENSIS. The type, as of *Q. longifolia* Liebmann (Guatemala, *v. Warscewicz:* a, *no. 47;* b, *no. 48*). Photographed by permission at Dahlem.

PLATE 321. a, QUERCUS CAERULEOCARPA. The type (Mexico, *Endlich, 1365a*). Photographed by permission at Dahlem. b, QUERCUS GHIESBREGHTII. A representative specimen (Mexico, *Liebmann*). Photographed by permission at Copenhagen.

PLATE 322. QUERCUS GHIESBREGHTII. The type (Mexico, *Galeotti, 128*). Photographed for Professor Bommer at Brussels.

PLATE 323. QUERCUS ZEMPOALTEPECANA. a, The type (Mexico, *Nelson, 672*); b, Another collection (Mexico, *Smith, 778*). Both photographed by permission at Washington.

PLATE 324. QUERCUS CUAJIMALPANA. The type (Mexico, *Arsène, 8866*). Photographed by permission at Washington.

PLATE 325. a, QUERCUS TLAPUXAHUENSIS. The type (Mexico, *Hartweg, 430*). Photographed by permission at Dahlem. b, QUERCUS TLAPUXAHUENSIS OBCONICA. The type (Mexico, *Bourgeau, 1013* in part). Photographed by permission at Cambridge.

PLATE 326. QUERCUS LANCEOLATA. The type collection (Mexico, *Bonpland*). Photographed by permission at Dahlem.

PLATE 327. QUERCUS LAURINA. a, The type collection (Mexico, *Bonpland*); b, A later collection (Mexico, *Ehrenberg, 1007*). Both photographed by permission at Dahlem.

PLATE 328. QUERCUS LAURINA. Two cotypes (Mexico, *Bonpland*). Photographed by permission at Dahlem.

PLATE 329. QUERCUS LAURINA. The type (Mexico, *Bonpland*). Photographed for M. Lecomte at Paris. Though the specific names *lanceolata* and *laurina* seem best to fit, respectively, the narrower- and broader-leaved oaks collected about Moran by Bonpland, the specimens, of which a few have been selected for this and the preceding plates, were labeled rather according to what seem to be untenable cup-scale characters. This shoot, paralleling what apparently was intended to be shown by pl. 80 of Humboldt and Bonpland, bears its fruit below the site of a terminal bud which has grown into a continuation of the twig, apparently invalidating the only character on which *lanceolata* and *laurina* have appeared to me separable.

PLATE 330. QUERCUS MAJOR. The type, as of *Q. nitens major* (Mexico, *Liebmann:* a, in the Candollean herbarium at Geneva; b, in the Hookerian herbarium at Kew). Photographed by permission.

PLATE 331. QUERCUS BARBINERVIS. The type (Mexico, *Hartweg, 427:* a, at Dahlem; b, at Kew). Photographed by permission.

PLATE 332. QUERCUS AFFINIS. The type, as of *Q. nitens* (Mexico, *Galeotti, 115*). Photographed for Professor Bommer at Brussels.

PLATE 333. a, QUERCUS AFFINIS COMMUTATA. The type (Mexico, *Schiede, 18*). Photographed by permission in the Candollean herbarium at Geneva. b, QUERCUS AFFINIS SUBINTEGRA. The type, as of *Q. nitens subintegra* (Mexico, *Hartweg, 422*). Photographed by permission in the Boissier herbarium at Geneva.

PLATE 334. QUERCUS OCOTEAEFOLIA. a, The type (Mexico, *Liebmann, 122–3520*). Photographed by permission at Copenhagen. b, A western collection (Mexico, *Ross, 378*); photographed by permission at Munich.

PLATE 335. a, QUERCUS OCOTEAEFOLIA PODOCARPA. The type, as of *Q. nitens podocarpa* (Mexico, *Liebmann, 3441*). Photographed by permission in the Candollean herbarium at Geneva. b, QUERCUS OCOTEAEFOLIA CONFUSA. The type (Mexico, *Liebmann*). Photographed by permission at Copenhagen.

PLATE 336. a, QUERCUS BOURGAEI. The type (Mexico, *Bourgeau, 1013*). Photographed by permission in the Boissier herbarium at Geneva. b, QUERCUS BOURGAEI ILICIFOLIA. The type (Mexico, *Pringle, 10315*). Photographed by permission in the Delessert herbarium at Geneva.

PLATE 337. QUERCUS DEPRESSA. A fruiting specimen (Mexico, *Galeotti, 5*). Photographed for Professor Bommer at Brussels.

PLATE 338. a, QUERCUS DEPRESSA. The type collection (Mexico, *Bonpland*). Photographed by permission in the Willdenovian herbarium at Dahlem. b, QUERCUS SUBAVENIA. The type (Mexico, *Pringle, 8908*). Photographed by permission in the Delessert herbarium at Geneva.

PLATE 339. a, QUERCUS SIDEROXYLA. The type (Mexico, *Bonpland*). Photographed by permission at Paris. b, QUERCUS HYPOXANTHA. The type (Mexico, *Pringle, 10227*). Photographed by permission at Cambridge.

PLATE 340. a, QUERCUS CHRYSOPHYLLA. The type collection (Mexico, *Bonpland*); b, QUERCUS TRIDENS. The type collection (Mexico, *Bonpland*). Both photographed by permission at Dahlem.

PLATE 341. QUERCUS TRISTIS. The types (Guatemala, *v. Warscewicz:* a, *no. 12;* b, *no. 14*). Photographed by permission at Dahlem.

PLATE 342. a, QUERCUS TRISTIS SUBLOBATA. The type (Guatemala, *v. Warscewicz, 10*). Photographed by permission in the Boissier herbarium at Geneva. b, QUERCUS TRISTIS VULCANI. The type (Guatemala, *Scherzer*). Photographed by permission at Vienna.

PLATE 343. a, QUERCUS TRISTIS NIEDERLEINI. The type (El Salvador, *Niederlein*, 1898). Photographed by permission at Dahlem. b, QUERCUS SCHERZERI. The type (Honduras, *Scherzer*, 1854). Photographed by permission at Vienna.

PLATE 344. QUERCUS WESMAELI. a, The type (Costa Rica, *Pittier, 773*); b, Another collection (Costa Rica, *Tonduz, 11827*). Both photographed by permission at Dahlem.

PLATE 345. a, QUERCUS CONSOCIATA. The type (Guatemala, *v. Warscewicz, 9*); b, QUERCUS MEXICANA ANGUSTIFOLIA. The type, as of *Q. crassipes angustifolia* (Mexico, *Bonpland*). Both photographed by permission at Dahlem.

PLATE 346. QUERCUS MEXICANA. Two cotypes (Mexico, *Bonpland*). Photographed by permission at Dahlem.

PLATE 347. a, QUERCUS MEXICANA LANOSA. The type (Mexico, *Hartweg, 431*); b, QUERCUS MEXICANA BONPLANDI. The type (Mexico, *Bonpland*). Both photographed by permission at Dahlem.

PLATE 348. a, QUERCUS IMBRICARIAEFOLIA. The type (Mexico, *Endlich, 1012*); b, QUERCUS MALIFOLIA. The type (Mexico, *Ross, 256*). Both photographed by permission at Dahlem.

PLATE 349. a, QUERCUS COLIMAE. The type (Mexico, *Burnett*); b, QUERCUS COLIMAE ZAUZILLO. The type (Mexico, *Burnett*). Both photographed by permission from Washington material.

PLATE 350. QUERCUS CRASSIPES. The type collection (Mexico, *Bonpland*). Photographed by permission: a, at Paris; b, at Dahlem.

PLATE 351. a, QUERCUS CRASSIPES. A specimen showing the characteristic inrolling of the cup (Mexico, *Uhde, 290*). Photographed by permission at Dahlem. b, QUERCUS OBOVALIFOLIA. The type (Mexico, *Bourgeau, 1014*). Photographed by permission at Copenhagen.

PLATE 352. QUERCUS AXILLARIS. The type (Mexico, *Bourgeau*). Photographed by permission: a, in the Boissier herbarium at Geneva; b, at Dahlem.

PLATE 353. QUERCUS SUBCRISPATA. The type (Mexico, *Nicolas, 5926*). Photographed by permission at Washington.

PLATE 354. QUERCUS LANIGERA. The type (Mexico, *Galeotti, 104*). Photographed for Professor Bommer at Brussels.

PLATE 355. QUERCUS LANIGERA SIDEROXYLOIDES. The type (Mexico, *Nicolas*). Photographed by permission in the Field Museum at Chicago.

PLATE 356. QUERCUS CIRCUMMONTANA. The type (Mexico, *Liebmann, 5455*). Photographed by permission at Copenhagen.

PLATE 357. QUERCUS FOURNIERI. The type (Mexico, *Hahn, 255*). Photographed for M. Lecomte at Paris.

PLATE 358. QUERCUS CASTANEA. a, A sketch of the type made at Madrid by Professor Lange. b, A fruiting specimen (Mexico, *Ehrenberg, 1171*). Photographed by permission: a, at Copenhagen; b, at Dahlem.

PLATE 359. QUERCUS CASTANEA ELLIPTICA. a, A sketch of the type of *Q. elliptica*, made at Madrid by Professor Lange. b, A Mexican specimen (*Ehrenberg, 987*). Photographed by permission at Dahlem.

PLATE 360. QUERCUS PULCHELLA. The type (Mexico, *Bonpland, 4230*); Photographed for M. Lecomte at Paris.

PLATE 361. a, QUERCUS SERRULATA. The type (Mexico, *Jones, 445*). Photographed by permission at Washington. b, QUERCUS ALAMOSENSIS. The type (Mexico, *Palmer, 370*). Photographed by permission at Cambridge.

PLATE 362. QUERCUS ROSSII. Two Mexican collections (a, *Ross, 505;* b, *Ross, 574*, the type). Photographed by permission at Dahlem.

PLATE 363. a, QUERCUS TEPOXUCHILENSIS. The type (Mexico, *Arsène, 201*). Photographed by permission at Dahlem. b, QUERCUS SIMILLIMA. The type (Mexico, *Parry & Palmer*). Photographed by permission at St. Louis.

PLATE 364. a, QUERCUS IMPRESSA. The type (Mexico, *Pringle, 6029*); b, QUERCUS SELERI. The type (Mexico, *Seler, 4302*). Both photographed by permission at Dahlem.

PLATE 365. QUERCUS RUGULOSA. The type (Mexico, *Galeotti, 116*); Photographed for Professor Bommer at Brussels.

PLATE 366. a, QUERCUS ROSEOVENULOSA. The type (Mexico, *Purpus, 1797*). Photographed by permission at St. Louis. b, QUERCUS SIPURACA. The type (Mexico, *Endlich, 1286*). Photographed by permission at Dahlem.

PLATE 367. QUERCUS ACHERDOPHYLLA. The types (Mexico, *Pringle, 10008*). Photographed by permission at Dahlem.

PLATE 368. QUERCUS SALTILLENSIS. The types (Mexico, *Palmer, 1277*). Photographed by permission at Cambridge.

PLATE 369. a, QUERCUS SALTILLENSIS. A cotype (Mexico, *Palmer, 1277*). Photographed by permission at Kew. b, QUERCUS CARNEROSANA. The type (Mexico, *Pringle, 2802*). Photographed by permission at the Arnold Arboretum.

PLATE 370. a, QUERCUS CERIFERA. The type (Mexico, *Cook, 116*). Photographed by permission at Washington. b, QUERCUS CRISPIFILIS. The type (Guatemala, *Seler, 2667*). Photographed by permission at Dahlem.

PLATE 371. QUERCUS CINNAMOMEA. The type (Guatemala, *Cook, 27*). Photographed by permission at Washington.

PLATE 372. QUERCUS GRANDIS. The type (Guatemala, *v. Warszewicz, 20*). Photographed by permission at Dahlem.

PLATE 373. a, QUERCUS GRANDIS TENUIPES. The type (Mexico, *Galeotti, 135*). Photographed by permission in the Delessert herbarium at Geneva. b, QUERCUS CORTESII. The type (Mexico, *Liebmann, 5463*). Photographed by permission at Copenhagen.

PLATE 374. QUERCUS HUITAMALCANA. The type, as of *Q. Serra* Liebm. (Mexico, *Liebmann, 5560*). Photographed by permission at Copenhagen.

PLATE 375. QUERCUS CHIAPASENSIS FALCILOBATA. The type (Mexico, *Reeves, 5*). Photographed at the University of Illinois.

PLATE 376. QUERCUS CHIAPASENSIS. The type (Mexico, *Purpus, 6999*). Photographed at the University of Illinois.

PLATE 377. a, QUERCUS CHIAPASENSIS. Type fruit (Mexico, *Purpus, 6999*). Photographed at the University of Illinois. b, QUERCUS BRENESII. The type (Costa Rica, *Brenes, 14520*). Photographed by permission at Dahlem.

PLATE 378. QUERCUS SKINNERI. a, The type collection (Guatemala, *Hartweg, 615*). Photographed by permission at Dahlem. b, Fruit, without data. Photographed by permission at Copenhagen.

PLATE 379. a, QUERCUS KARWINSKII. The type (Mexico, *Karwinski*). Photographed by permission at Munich. b, QUERCUS CANBYI. The type (Mexico, *Pringle, 2393*). Photographed by permission at Dahlem.

PLATE 380. a, QUERCUS CANBYI ASCENDENS. The type (Mexico, *Pringle, 11705*). Photographed by permission at Dahlem. b, QUERCUS CANBYI BERLANDIERI. The type (Mexico, *Berlandier, 2221*). Photographed by permission in the Boissier herbarium at Geneva.

PLATE 381. QUERCUS SARTORII. a, The type (Mexico, *Liebmann, 5554*); b, Fruit (Mexico, *Rathsack, 487*). Both photographed by permission at Copenhagen.

PLATE 382. QUERCUS FURFURACEA. a, The type (Mexico, *Liebmann, 191=5438*); b, Fruit (Mexico, *Rathsack, 1109*). Both photographed by permission at Copenhagen.

PLATE 383. QUERCUS GRAHAMI. The type collection (Mexico, *Graham, 526*). Photographed by permission: a, in the Benthamian herbarium at Kew; b, in the Gray herbarium at Cambridge.

PLATE 384. a, QUERCUS GRAHAMI BREVIPES. The type (Mexico, *Liebmann, 33=3437*). Photographed by permission at Kew. b, QUERCUS GRAHAMI NELSONI. The type (Mexico, *Nelson, 535*). Photographed by permission at Washington.

PLATE 385. QUERCUS TONAGUIAE. The type (Mexico, *Galeotti*). Photographed by permission at Dahlem.

PLATE 386. QUERCUS VEXANS. The type (Mexico, *Purpus*, 1914). Photographed at the University of Illinois.

PLATE 387. QUERCUS CANDOLLEANA. The type (Mexico, *Ghiesbreght, 124*). Photographed by permission in the Candollean herbarium at Geneva.

PLATE 388. QUERCUS CONSPERSA. The type collection (Guatemala, *Hartweg, 617*). Photographed by permission at Dahlem.

PLATE 389. a, QUERCUS CONSPERSA. A flowering specimen (Guatemala, *Heyde & Lux, 3154*). Photographed by permission at Dahlem. b, QUERCUS CONSPERSA OVATIFOLIA. The type (Guatemala, *v. Warscewicz, 28*). Photographed by permission in the Boissier herbarium at Geneva.

PLATE 390. QUERCUS ACUTIFOLIA. a, A sketch of the type made by Professor Lange at Madrid; b, A specimen of the typical collection of *Q. acutifolia Bonplandii* (Mexico, *Bonpland, 3917*). Photographed by permission at Dahlem.

PLATE 391. a, QUERCUS ACUTIFOLIA. The type collection of *Q. acutifolia Bonplandii* (Mexico, *Bonpland, 3917*). Photographed by permission at Dahlem. b, QUERCUS ACUTIFOLIA ANGUSTIFOLIA. The type (without locality, supposedly from Née); photographed by permission in the Candollean herbarium at Geneva.

PLATE 392. QUERCUS XALAPENSIS. a, A flowering specimen (Mexico, *Pringle, 8108*); b, The type collection (Mexico, *Bonpland, 4467*). Photographed by permission at Dahlem.

PLATE 393. a, QUERCUS XALAPENSIS JALAPAE. The type (Mexico, *Schiede, 18*). Photographed by permission at Dahlem. b, QUERCUS XALAPENSIS SURCULINA. The type (Mexico, *Karwinski*). Photographed by permission at Munich.

PLATE 394. QUERCUS ALBOCINCTA. The type (Mexico, *Rose, Standley & Russell, 12787*). Photographed by permission: a, at Washington; b, at New York.

PLATE 395. QUERCUS. *The Coccineae.* 1. QUERCUS MAXIMA. A representative form of leaf, though more toothed than usual (Illinois, *Trelease, 16152*). 2. QUERCUS SHUMARDII. A characteristic leaf (Illinois, *Trelease, 16165*).

PLATE 396. QUERCUS. *The Coccineae.* 1. QUERCUS COCCINEA. A characteristic leaf (South Carolina, *Davis, 7662*). 2. QUERCUS TEXANA. A characteristic leaf, from the type locality (Texas, *Simonds, 2*). 3. QUERCUS ELLIPSOIDALIS. A characteristic leaf, from the type tree (Illinois, *Mrs. Chase, 1003*).

PLATE 397. QUERCUS ILICIFOLIA. 1. Two leaves from one branch, the larger one representative (Connecticut, *Bissell, 55*). 2. Aberrant leaf forms (Maryland, *Norton, 24*).

PLATE 398. QUERCUS VELUTINA. 1. A characteristic form of the type, after Michaux (pl. 24). 2. QUERCUS VELUTINA PAGODAEFORMIS (Maryland, *Norton, 27*).

PLATE 399. QUERCUS VELUTINA. 1. QUERCUS VELUTINA ANGULOSA (Illinois, *Andrews*, 1893). 2. QUERCUS VELUTINA DILANIATA (Illinois, *Nason*, 1879).

PLATE 400. QUERCUS MARILANDICA. 1. The typical form (Illinois, *Welsch*). 2. QUERCUS MARILANDICA AEQUILOBATA (Illinois, *Schneck, 356*). 3. QUERCUS MARILANDICA PAUCIDENTATA (Illinois, *Trelease, 16113*).

PLATE 401. QUERCUS MARILANDICA. 1. QUERCUS MARILANDICA SUBTYPICA (New Jersey, *Wilson*). 2. QUERCUS MARILANDICA CUNEATA (Illinois, *Brendel*). 3. QUERCUS MARILANDICA OBOVATA (Maryland, *Norton*).

PLATE 402. QUERCUS MARILANDICA. 1. QUERCUS MARILANDICA INCISA (Illinois, *Schneck*, 1902. 2. QUERCUS MARILANDICA TRUNCATA (Texas, *Farr, 9*). 3. QUERCUS MARILANDICA SUBLYRATA (Illinois, *Trelease, g*).

PLATE 403. QUERCUS MARILANDICA. 1. QUERCUS MARILANDICA SUBQUINQUELOBA (Illinois, *Wright, 4*). 2. QUERCUS MARILANDICA QUINQUELOBA. A cotype (Missouri, *Engelmann*, 1849).

PLATE 404. QUERCUS LAEVIS. Two of the commoner leaf-forms, after Michaux: 1. Silva, vol. 1, pl. 22; 2. Hist. Chênes Amér., pl. 29.

PLATE 405. 1. QUERCUS LAEVIS LINEARILOBA. The type (Florida, *Nash, 1645*), about one-third natural size. Photographed by permission in Washington. 2. QUERCUS LAEVIS RAPPII. The type (Florida, *Rapp*). Photographed in Urbana.

PLATE 406. QUERCUS RUBRA. 1. A representative leaf (Texas, *Fisher, 5105*). 2. QUERCUS RUBRA FALCATA (Indiana, *Deam, 24321*). 3. QUERCUS RUBRA TRILOBA (Illinois, *Welsch*). 4. QUERCUS RUBRA CUNEATA (Texas, *Sterrett, 27*).

PLATE 407. QUERCUS PAGODA. 1. A representative leaf (Illinois, *Schneck*). 2. QUERCUS PAGODA SINUATA (Illinois, *Trelease, 16114*). 3. QUERCUS PAGODA COCCINIAEFOLIA (Texas, *Fisher, 4*). 4. QUERCUS PAGODA TRUNCATA. A lateral lobe (Texas, *Sterrett, 17*). 5. QUERCUS PAGODA INTERMEDIA. A lateral lobe (Mississippi, *Sterrett, 24*).

PLATE 408. QUERCUS PAGODA JUVENILIS: 1, 2. Louisiana (*Sterrett, 3*); 3. North Carolina (*Ashe*, 1898).

PLATE 409. QUERCUS CALOPHYLLA. The type collection (Mexico, *Schiede, 24*). Photographed by permission at Dahlem.

PLATE 410. QUERCUS CALOPHYLLA. Other specimens of the type collection; one showing fruit, not included in the original description. Photographed by permission at Dahlem.

PLATE 411. QUERCUS CALOPHYLLA WILLDENOVIANA. 1. The type (Mexico, *Bonpland*, as *no. 17613* in the Willdenovian herbarium). Photographed by permission at Dahlem. 2. A fruiting specimen (Mexico, *Rathsack, 492*). Photographed by permission at Copenhagen.

PLATE 412. 1. QUERCUS CALOPHYLLA WILLDENOVIANA. A cotype (Mexico, *Bonpland*). Photographed by permission at Dahlem. 2. QUERCUS CALOPHYLLA FLAVIDA. The type of *Q. flavida* (Mexico, *Liebmann, 2*). Photographed by permission at Copenhagen.

PLATE 413. QUERCUS CALOPHYLLA ACUMINATA. The type of *Q. acuminata* (Mexico, *Galeotti, 96*). Photographed, one-third natural size, for Professor Bommer at Brussels.

PLATE 414. QUERCUS CALOPHYLLA ACUMINATA. A part of the type material of *Q. acuminata*. Photographed for Professor Bommer at Brussels.

PLATE 415. QUERCUS CALOPHYLLA INTERMEDIA. The type of *Q. intermedia* (Mexico, *Galeotti, 132*). Photographed for Professor Bommer at Brussels.

PLATE 416. QUERCUS CALOPHYLLA ALAMO. The type collection of *Q. Alamo* (Mexico, *Hartweg, 420*). Photographed by permission at Dahlem.

PLATE 417. QUERCUS CANDICANS. What is taken for representative material (Mexico, *Burnett*).

PLATE 418. 1. QUERCUS CANDICANS MICHOACANA. The type (Mexico, *Pringle, 3955*). 2. QUERCUS CANDICANS INCURVA. The type (Mexico, *Rose, 2999*).

PLATE 419. QUERCUS. *The Agrifoliae*. Two extreme forms of QUERCUS KELLOGGII from California (1, *Grant, 1084;* 2, *Schneck*, 1901); and two extremes of QUERCUS WISLIZENI, from California (3, *Heller, 10689;* 4, *Grant, 1088*).

PLATE 420. 1. QUERCUS AGRIFOLIA (California, *Haenke*, evidently a subtypical collection). Photographed in the National herbarium at Prag by permission. 2. QUERCUS PRICEI. A cotype communicated to the New York Botanical Garden by Sudworth. Photographed by permission.

INDEX.

A. COLLECTIONS.

B. COUNTRIES AND REGIONS.

C. NAMES.

INDEXES.

A. COLLECTIONS.

Andrews.
(1916). Q. novomexicana.
Anthony.
248. Q. tomentella.
Apollinaire.
(1909). Q. Humboldtii.
Arsène.
(1911). Q. Purpusi.
(1911). Q. tlapuxahuensis.
4, 106, 112, 2068, 2100, 5053, 5923, 5927, 7053. Q. pulchella.
30, 33, 5913, 6004. Q. Rossii.
31, 3235, 5365, 5673, 5750, 6037. Q. fulva.
105. Q. glaucoides.
195, 5924, 7052, 7131. Q. centralis.
201. Q. tepoxuchilensis.
1050. Q. ocoteaefolia.
1067. Q. Grahami.
2100. ?Q. dysophylla.
2759. Q. macrophylla
2935, 6018. Q. Hartwegi.
2942, 2975, 3488, 5927. Q. transmontana.
3527. Q. crassipes.
5312, 5556, 5826, 6682. Q. innuncupata.
5373, 6018. Q. rhodophlebia.
5419, 5806, 6038. Q. candicans.
5525. Q. conglomerata.
5807, 6036. Q. incarnata.
5859. Q. epileuca.
5926. Q. subcrispata.
6004 bis. Q. campanariensis.
6031. Q. salicifolia.
6681. Q. moreliana.
7100. Q. decipiens.
8866. Q. cuajimalpana.
Aschenborn.
158. Q. microphylla.
Baker. (*See* Heilprin.)
Barber. (*See* Heller; Townsend.)
Barbey.
(1888). Q. reticulata.
Barclay.
—— Q. aristata.
Barlow.
(1911). Q. Emoryi.
Beals.
(1904). Q. Emoryi.
Belding.
7, 9. Q. idonea.
8. Q. Brandegei.
Berger.
1, 2. Q. polymorpha.
Berlandier.
A, 241. Q. crassifolia.
B. Q. polymorpha.
Berlandier—Continued.
146, 1400, 1406, 1781. Q. breviloba.
410. Q. affinis.
411. Q. revoluta dysophyllopsis.
429, 533. Q. toxicodendrifolia.
774, 2194. Q. oleoides.
801, 2221. Q. Canbyi.
1051. Q. calophylla.
1147, 2131. Q. Martensiana.
1223–4. Q. microphylla.
1239. Q. mexicana.
1285. Q. jaralensis.
Bernouili & Cario.
1100. Q. conspersa.
Biener Herb.
—— Q. polymorpha.
Bigelow.
—— Q. Emoryi.
—— Q. grisea.
—— Q. undulata.
(1850). Q. fusiformis.
Bilimek.
7178. Q. Martensiana.
Blake.
—— Q. Emoryi.
Blumer.
62, 348, 1257–9, 1275. Q. arizonica.
86, 1261. Q. hypoleuca.
1279. Q. Emoryi.
1280. Q. Toumeyi.
1294, 1309, 1921, 1960, 3467. Q. diversicolor.
1297. Q. oblongifolia.
Bonpland.
—— Q. almaguerensis.
—— Q. Bonplandiana.
—— α, β Q. crassifolia.
—— Q. crassipes.
—— Q. depressa.
—— Q. lanceolata.
—— Q. mexicana.
—— Q. pulchella.
—— Q. sideroxyla.
—— Q. stipularis.
—— Q. tolimensis.
—— Q. tridens.
2083. Q. Humboldtii.
3917. Q. acutifolia.
3921. Q. glaucescens.
3937. Q. peduncularis.
4060, 4163, 4218, 4409. Q. mexicana.
4061. Q rugosa.
4062. Q. chrysophylla.
4143. Q. laurina.
4269. Q. coccolobaefolia.
4270. Q. calophylla.

Bonpland—Continued.
4329, 4330. Q. obtusata.
4358. Q. repanda.
4405. Q. macrophylla.
4408. Q. reticulata.
4467. Q. xalapensis.
Botteri.
186. Q. calophylla.
541, 1002. Q. Martensiana.
858. Q. xalapensis.
887. Q. polymorpha.
942. Q. lancifolia.
952. Q. Sartorii.
1032. Q. Ghiesbreghtii.
Bourgeau.
—— Q. laeta.
(1865), 271, 424, 1015. Q. mexicana.
(1865–6). Q. deserticola.
68, 645, 1007, 1010, 1015. Q. Frutex.
224, 427, 744, 1139, 1140. Q. crassipes.
271–2, 1005–6, 1008, 1012, 1133–5, 1141, 1142. Q. conglomerata.
301. Q. lancifolia.
425. Q. imbricariaefolia.
426, 1069. Q. centralis.
1013 pp. Q. Bourgaei.
1013 pp. Q. tlapuxahuensis.
1014. Q. obovalifolia.
1136, 1138. Q. axillaris.
Brandegee.
(1889, 1890, 1893). Q. idonea.
(1890, 1893). Q. Palmeri.
(1892, 1893). Q. Brandegei.
(1893). Q. dumosa.
(1893). Q. peninsularis.
Braun Herb.
(1851). Q. mexicana.
Brenes.
14520. Q. Brenesi.
Brewer.
—— Q. durata.
Brewster.
(1887). Q. devia.
Bridges.
(1855). Q. Seemanni.
Britton, Britton & Cowell.
9650, 10108. Q. virginiana.
—— —— & Gager.
7304–5. Q. virginiana.
—— & Earle.
6580. Q. virginiana.
Brown.
(1905). Q. chihuahuensis.
(1905). Q. oblongifolia.
(1905). Q. Toumeyi.
(1905). Q. viminea.
(1906). Q. tomentella.
Burnett.
(1913). Q. candicans.
(1913). Q. colimae.
(1913). Q. panduriformis.
(1913). Q. Rossii.
Calderon.
1430. Q. comasaguana.
Canby, Sargent & Trelease.
224. Q. Canbyi.
225. Q. porphyrogenita.
227. Q. fusiformis.
229, 230. Q. polymorpha.
Cario. (*See* Bernouili.)
Carpenter.
1554. Q. Andromeda.
Carreiro.
6. Q. acutifolia.
14. Q. calophylla.
Cockerell.
—— Q. Rydbergiana.
Collins & Doyle.
118. Q. conspersa.
Conzatti.
1414, 1820, 1821. Q. glaucoides.
1415. Q. lanigera.
1416. Q. mixtecana.
1807, 1901. Q. chartacea.
1808. Q. glaucophylla.
1900. Q. Conzattii.
2216. Q. Radlkoferiana.
3553. Q. Grahami.
—— & Gomez.
2390. Q. scytophylla.
Cook.
13. Q. callosa.
14, 247, 278, 288. Q. conspersa.
15, 266. Q. purulhana.
15–22. Q. virginiana.
25, 30. Q. brachystachys.
27. Q. cinnamomea.
28. Q. Donnell-Smithii.
78, 79. Q. sebifera.
99, 109. Q. crispipilis.
116, 117. Q. cerifera.
220. Q. oocarpa.
236, 291. Q. parviglans.
—— & Doyle.
280, 286. Q. Barbeyana.
282. Q. conspersa.
285. Q. callosa.
—— & Griggs.
318. Q. oleoides.
569, 571. Q. corrugata.
572. Q. oocarpa.
574. Q. callosa.
607. Q. flagellifera.
615. Q. Skinneri.
Correa.
13. Q. calophylla.
Cowell. (*See* Britton.)
Deam.
125. Q. conglomerata.
159. Q. oleoides.
6087, 6218. Q. conspersa.
Deppe.
A, B. Q. glabrescens.
C. Q. barbinervis.

Deppe—Continued.
D. Q. mexicana.
—— Q. reticulata.
Diguet.
—— Q. convallata.
—— Q. devia.
—— Q. idonea.
Doyle. (*See* Collins; Cook.)
Dugès.
(1895). Q. repanda.
(1902). Q. affinis.
(1902). Q. crassipes.
i. Q. macrophylla.
iv, 2, 3. Q. reticulata.
v. Q. mexicana.
vi, 4, 5. Q. sideroxyla.
6, 7. Q. barbinervis.
Dunn.
—— Q. dumosa.
(1888). Q. Palmeri.
Earle. (*See also* Britton.)
(1907). Q. virginiana.
115. Q. undulata.
Ehrenberg.
A, 262, 907. Q. crassifolia.
C, 895–6, 920, 1021, 1284. Q. errans.
D, E, F pp., 263. Q. glabrescens.
F pp., G pp., H, S, 265 pp., 925, 992. Q. repanda.
M, O, 1006–7, 1026–7. Q. laurina.
Q, 924. Q. depressa.
R′, 264, 1008. Q. barbinervis.
T–V, X, 261, 892. Q. mexicana.
W, 987, 1171, 1212. Q. castanea.
586 pp., 899–901, 909, 910. Q. Bonplandiana.
879, 897–8, 903–6, 908, 921–2. Q. reticulata.
893. Q. crassipes.
894, 956. Q. dysophylla.
902. Q. rugulosa.
911, 1022–3. Q. stipularis.
972, 1089. Q. polymorpha.
990. Q. calophylla.
1091–3. Q. alpescens.
1279. Q. sideroxyla.
Eisen & Vaslit.
(1895). Q. Brandegei.
Emory.
—— Q. Emoryi.
Emrich.
19, 63. Q. circinata.
108. Q. tahuasalana.
113. Q. chiquihuitillonis.
Endlich.
1. Q. undata.
2, 4. Q. Eduardi.
2a, 9, 1277, 1277a–b, 1279, 1281. Q. Duraznillo.
3 pp. Q. depressipes.
3 pp. Q. striatula.
3a, 1283. Q. oblongifolia.
5, 643, 1285. Q. fulva.
6. 1284. Q. Endlichiana.
7, 782a–b, d, 790d. Q. incarnata.
8, 1282, 1282a. Q. Sacame.
Endlich—Continued.
376a, 377, 1011. Q. rugosa.
376b. Q. castanea.
378. Q. crassipes.
453, 1331. Q. oleoides.
488. Q. intricata.
643. Q. conglomerata.
644, 1365b. Q. Bourgaei.
653, 655. Q. texcocana.
770. Q. aurantiaca.
771. Q. chihuahuensis.
782a–b, d. Q. incarnata.
788. Q. undulata.
790b, 1286. Q. Sipuraca.
790c, 1280. Q. viminea.
1012. Q. imbricariaefolia.
1275. Q. balsequillana.
1352. Q. circinata.
1353. Q. uruapanensis.
1354. Q. glaucoides.
1355. Q. Rossii.
1356. Q. Harmsiana.
1357. Q. panduriformis.
1365a. Q. caeruleocarpa.
1365c. Q. centralis.
1385. Q. laxa.
Endres.
—— Q. borucasana.
—— Q. Endresi.
Engelmann & Sargent.
(1880). Q. arizonica.
(1880). Q. diversicolor.
(1880). Q. Emoryi.
Esquerra. (*See* Robredo.)
Evrendberg.
346. Q. oleoides.
Farr.
6. Q. stellata.
Fernow.
2. Q. candicans.
3. Q. Rossii.
Fink.
0. Q. oleoides.
1. Q. Galeottii.
2, 10, 11. Q. Sartorii.
3, 4, 12–14. Q. xalapensis.
5. Q. excelsa.
6, 8. Q. calophylla.
Fisher.
5716. Q. pseudomargaretta.
Franceschi.
4, 5. Q. tomentella.
Franco.
(1842). Q. calophylla.
Frazer.
(1887). Q. idonea.
Frémont.
a, b. Q. Emoryi.
Friedrichsthal.
—— Q. bumelioides.
1219. Q. oleoides.
1406, 1421. Q. citrifolia.

Gager. (*See* Britton.)
Galeotti.
—— Q. strombocarpa.
—— Q. tonaguiae.
1, 2, 4, 61, 95–7, 105, 132–3, 246, Q. calophylla.
3, 90, 120 pp. Q. Martensiana.
4, 134. Q. pubinervis.
5, 113. Q. depressa.
6, 10, 12, 100, 104, 112. Q. lanigera.
7b, 8. Q. sororia.
15, 92–3. Q. polymorpha.
18, 95 pp. Q. xalapensis.
91, 98. Q. oleoides.
97 pp. Q. circummontana.
99, 102. Q. chicamolensis.
101 pp., "102." Q. chartacea.
101 pp., 109. Q. Grahami.
103, 111. Q. glaucoides.
106. Q. ocoteaefolia.
108. Q. oajacana.
110. Q. Liebmannii.
112. Q. perseaefolia.
114. Q. crassifolia.
115. Q. affinis.
116. Q. rugulosa.
118. Q. mexicana.
119. Q. laxa.
120. Q. obtusata.
121. Q. uruapanensis.
"121," 123–5. Q. insignis.
126. Q. Galeottii.
127. Q. Sartorii.
128. Q. Ghiesbreghtii.
129. Q. leiophylla.
130. Q. glabrescens.
131. Q. decipiens.
134. Q. nectandraefolia.
135–6. Q. grandis.
Ghiesbreght.
1, 10. Q. Sartorii.
2, 5, 7. Q. calophylla.
4, 9. Q. circummontana.
8. Q. polymorpha.
11, 124. Q. xalapensis.
12, 125–8. Q. Martensiana.
"12." Q. Galeottii.
13. Q. Ghiesbreghtii.
115, 118, 119, 122, 129. Q. perseaefolia.
117, 121. Q. synthetica.
124. Q. Candolleana.
Goldman. (*See also* Nelson.)
142. Q. Hartmani.
727. Q. oleoides.
919. Q. crispipilis.
1054. Q. conspersa.
Gomez. (*See* Conzatti.)
Goodding.
169. Q. Emoryi.
237. Q. hypoleuca.
711. Q. Toumeyi.
Goudet.
(1844). Q. Humboldtii.
Graham.
325, 328. Q. reticulata.
326. Q. Grahami.
329. Q. crassifolia.
330. Q. calophylla.
333. Q. circummontana.
335, 337. Q. barbinervis.
336. Q. tlapuxahuensis.
Greene.
—— Q. subturbinella.
(1877). Q. Emoryi.
(1889). Q. dumosa.
Gregg.
222. Q. fusiformis.
223. Q. porphyrogenita.
296, 318. Q. intricata.
319. Q. Pringlei.
380. Q. Greggii.
638, 638a. Q. crassifolia.
703. Q. crassipes.
724. Q. centralis.
796. Q. Hartwegi.
797. Q. circummontana.
976. Q. lutea.
977. Q. productipes.
989. Q. laxa.
Griffiths.
2058, 6779. Q. Emoryi.
2120, 2623. Q. oblongifolia.
—— & Thornber.
118. Q. hypoleuca.
316. Q. Emoryi.
Griggs. (*See* Cook.)
Haenke.
—— Q. orizabae.
(1792). Q. lobata.
270. Q. circinata.
275. Q. acutifolia.
373. Q. glaucescens.
Hahn.
—— Q. rugosa.
—— Q. Sartorii.
—— Q. xalapensis.
(1866). Q. Lecomteana.
(1866), 278, 344. Q. germana.
(1868), 346, 349, 354. Q. crassipes.
14, 366b. Q. mexicana.
255. Q. Fournieri.
294. Q. lancifolia.
347. Q. Hahnii.
376. Q. candicans.
667. Q. errans.
1000. Q. calophylla.
1141. Q. conglomerata.
Hartman.
28, 363, 466, 467. Q. oblongifolia.
72, 131. Q. Duraznillo.
132, 315. Q. chihuahuensis.
336–7. Q. epileuca.
342. Q. viminea.
343, 713. Q. pennivenia.
584. Q. hypoleuca.

Hartman—Continued.
633. Q. Hartmani.
903–4. Q. arizonica.
Hartweg.
419. Q. laeta.
420. Q. polymorpha.
421. Q. dysophylla.
422. Q. affinis.
423. Q. calophylla.
424, 426. Q. stipularis.
425. Q. repanda.
"426," 428. Q. glabrescens.
427. Q. barbinervis.
429. Q. conglomerata.
430. Q. tlapuxahuensis.
431. Q. mexicana.
432. Q. Hartwegi.
563. Q. Benthami.
564, 616. Q. callosa.
615. Q. Skinneri.
617. Q. conspersa.
618. Q. brachystachys.
619. Q. Donnell-Smithii.
1393. Q. Humboldtii.
Havard.
54. Q. breviloba.
Hay. (*See* Maxon.)
Hayes.
(1860). Q. brachystachys.
(1860). Q. callosa.
(1860). Q. conspersa.
(1860). Q. parviglans.
(1860). Q. tristis.
Heilprin & Baker.
2, 4, 5. Q. circinata.
3, Q. pandurata.
Heller.
12. Q. circummontana.
—— & Barber.
5. Q. decipiens.
Henry.
1. Q. Hartwegi.
2. Q. glabrescens.
3. Q. mexicana.
Heyde.
1. Q. conspersa.
—— & Lux.
3151, 3154. Q. conspersa.
3152. Q. barbanthera.
Hinds.
(1841). Q. aristata.
Hoffmann.
127–9. Q. costaricensis.
863. Q. eugeniaefolia.
Hooker herbarium.
—— Q. polymorpha.
Huebsch.
—— Q. costaricensis.
—— Q. oocarpa.
Jamain herbarium.
—— Q. virginiana.
James.
—— Q. undulata.
Jervill.
—— Q. Humboldtii.
Jones.
440. Q. crenatifolia.
441–2, 444. Q. magnoliaefolia.
445. Q. serrulata.
446. Q. Jonesi.
4245. Q. arizonica.
Juergensen.
682. Q. calophylla.
Kalbreyer.
1469. Q. Humboldtii.
Karsten.
—— Q. Humboldtii.
Karwinski.
—— Q. Karwinskii.
—— Q. Martensiana.
—— Q. Uhdeana.
—— Q. xalapensis.
(1827). Q. calophylla.
(1827). Q. crassifolia.
(1827). Q. mexicana.
(1844). Q. oleoides.
(1844). Q. polymorpha.
(1844). Q. Pringlei.
Keerl.
(1829). Q. crassipes.
Kellerman.
4826, 4828, 5151. Q. acatenangensis.
4833. Q. tristis.
5028. Q. conspersa.
5658, 7032, 8043. Q. callosa.
5922. Q. pilicaulis.
Kerber.
201. Q. circummontana.
206, 208. Q. laxa.
375. Q. oleoides.
Kuntze.
2282, 2352. Q. costaricensis.
2344. Q. irazuensis.
La Sagra.
418. Q. virginiana.
Lacey.
—— Q. fusiformis.
—— Q. stellata.
Lamb.
577. Q. aristata.
Langlassé.
46. Q. candicans.
86. Q. circinata.
212. Q. chiquihuitillonis.
217. Q. tahuasalana.
239, 573, 600. Q. panduriformis.
1006. Q. Langlassei.
1066. Q. Urbani.
Lehmann.
ccxiii, 3886. Q. tolimensis.
1320. Q. conspersa.
1679. Q. Benthami.
1711. Q. Barbeyana.
1725. Q. pilicaulis.
2359, 2677, 3560, 3899, 7453. Q. Humboldtii.

Leibold.
233. Q. dysophylla.
237. Q. centralis.
Lemmon.
(1880, 1882). Q. diversicolor.
D, 104. Q. conglomerata.
100. Q. crassipes.
102. Q. xalapensis.
103. Q. germana.
105. Q. calophylla.
106. Q. major.
260, 262. Q. oblongifolia
Leon. (*See* Shafer.)
Liebmann.
—— Q. Juergensenii.
—— Q. oleoides.
(1841). Q. major.
(1841), 3523, 3564. Q. Martensiana.
2, 5, 7, 8, 3445–6, 3478. Q. calophylla.
11, 12, 14–17, 3551, 3552, 3554–5. Q. Sartorii.
18, 19, 3561. Q. Skinneri.
26–9, 3462–4, 3573. Q. Cortesii.
30, 31, 3560. Q. huitamalcana.
33, 34–5, 38–41, 3435, 3439, 3490, 3570. Q. Grahami.
45–7, 54–5, 60–65, 73, 75–6, 80, 82, 122–3, 3441, 3472, 3495, 3513, 3515, 3517, 3519–21. Q. ocoteaefolia.
48, 83–4, 223, 3496, 3497, 3539. Q. orizabae.
50. Q. affinis.
78, 3502–4. Q. leiophylla.
86, 3454–5. Q. circummontana.
89, 3505, 3526, 5742. Q. Liebmannii.
93–4, 96, 3457, 3459, 3498. Q. lanigera.
98–9, 108–9, 113, 3476, 3510. Q. perseaefolia.
100–102, 3506. Q. lingvaefolia.
103, 3475, 3489. Q. glaucoides.
111, 114, 3509, 3511. Q. nectandraefolia.
107, 205, 3477. Q. excelsa.
115, 217, 3568. Q. totutlensis.
140, 142–6, 3444, 3556–7. Q. scytophylla.
144, 150, 193, 3479. Q. floccosa.
147, 149, 3466–70. Q. felipensis.
151–2, 154–5, 3473, 3548–9. Q. aculcingensis.
153, 201, 216, 3546–7. Q. conglomerata.
156–8, 3483–5. Q. Radlkoferiana.
160–162, 164–7, 3486–8. Q. glabrescens.
174–7, 3563. Q. strombocarpa.
191–2, 3438, 3569. Q. furfuracea.
201, 3524, 3565. Q. peduncularis.
204, 3471. Q. chinantlensis.
208, 210, 211, 3480. Q. Galeottii.
3482. Q. Ghiesbreghtii.
3492–4. Q. insignis.
3527–31, 3533, 3536–8. Q. oleoides.
3540, 3542. Q. polymorpha.
3545. Q. decipiens.
3562. Q. sororia.
3571–4. Q. xalapensis.
Linden.
16, 24. Q. oleoides.
17. Q. calophylla.
20. Q. Martensiana.
143, 1149. Q. circummontana.
1052. Q. totutlensis.
Linden—Continued.
1240. Q. tolimensis.
1325. Q. Lindeni.
1335. Q. Humboldtii.
Lloyd.
130. Q. intricata.
224. Q. grisea.
465. Q. chihuahuensis.
466. Q. arizonica.
467. Q. oblongifolia.
468. Q. viminea.
Lowell.
(1910). Q. arizonica.
(1910–11). Q. Emoryi.
Lux. (*See* Hyde.)
Marsans.
(1903). Q. virginiana.
Martius herbarium.
—— Q. obtusata.
Matthews.
(1904). Q. durangensis.
Maxon & Hay.
3372. Q. parviglans.
Mayr.
(1887). Q. arizonica.
Mearns.
177, 497. Q. hypoleuca.
2230. Q. diversicolor.
2642, 2669. Q. oblongifolia.
Metcalfe.
45. Q. hypoleuca.
67, 618, 755–6, 1633a. Q. arizonica.
669, 2230. Q. diversicolor.
704, 1200. Q. Emoryi.
1115. Q. subturbinella.
2642. Q. oblongifolia.
Mohr.
—— Q. polymorpha.
(1857). Q. xalapensis.
Moloney.
(1896). Q. oleoides.
Montes & Salazar.
1169. Q. planipocula.
1730. Q. Langlassei.
Mueller.
333. Q. calophylla.
1210. Q. circummontana.
1597, 1747. Q. polymorpha.
Mulford.
713, 832. Q. arizonica.
783. Q. hypoleuca.
Née (Herb. Thibaud).
—— Q. acutifolia.
—— Q. peduncularis.
Née. (*See also* Pavon; Haenke.)
Nelson.
(1893). Q. centralis.
(1893). Q. revoluta.
(1893). Q. tepoxuchilensis.
1. Q. crassipes.
2pp. Q. coccolobaefolia.
2pp. Q. reticulata.
3pp. Q. Galeottii.

Nelson—Continued.
3pp. Q. simillima.
4 Q. pulchella.
67, 80. Q. oleoides.
91. Q. xalapensis.
532. Q. glaucophylla.
533. Q. Grahami.
672. Q. zempoaltepecana.
871. Q. lingvaefolia.
936. Q. calophylla.
3720. Q. Donnell-Smithii.
3721. Q. pilicaulis.
4946, 5001. Q. striatula.
5002. Q. durangensis.
6309. Q. oblongifolia.
6902. Q. ocoteaefolia.
6903, 7061. Q. candicans.
—— & Goldman.
7421, 7423, 7452. Q. idonea.
7422, 7475. Q. Brandegei.
7454, 7471. Q. devia.
Nicholson.
3152. Q. insignis.
3154. Q. reticulata.
Nicolas.
(1909, 1911), 5926, 5927. Q. tepoxuchilensis.
(1911). Q. glaucoides.
(1912). Q. lanigera.
5925. Q. manzanillana.
Niederlein.
(1898). Q. amphioxys.
(1898). Q. arachnoidea.
(1898). Q. gemmata.
(1898). Qoleoides.
(1898). Q. segoviensis.
(1898). Q. tristis.
O'Donovan.
1000. Q. virginiana.
Oersted.
4. Q. oleoides.
5, 3491. Q. borucasana.
6, 7, 3461. Q. citrifolia.
1265, 3465. Q. costaricensis.
3440. Q. conspersa.
3559. Q. segoviensis.
Orcutt.
(1882). Q. peninsularis.
(1882), 640. Q. dumosa.
639. Q. Palmeri.
Palmer. (*See also* Parry.)
(1869), 359. Q. Emoryi.
(1891). Q. vellifera.
29. Q. dumosa.
30. Q. Palmeri.
69. Q. alvarezensis.
70. Q. rugulosa.
76. Q. fulva.
77, 81, 85, 408. Q. Sacame.
82. Q. ariaefolia.
88–9. Q. tomentella.
220, 264, 318. Q. oleoides.
299, 1274, 2003. Q. fusiformis.
302. Q. Duraznillo.
Palmer—Continued.
333. Q. chiquihuitillonis.
334. Q. acapulcensis.
368. Q. viminea.
369. Q. infralutea.
370. Q. alamosensis.
371. Q. albocincta.
408, 828. Q. undata.
431, 468–9, 552–7, 744–751, 1178. Q. intricata.
445, 806. Q. striatula.
470. Q. Pringlei.
771. Q. durifolia.
956. Q. Eduardi.
1277. Q. saltillensis.
1278. Q. cordifolia.
Paary & Palmer.
(1873). Q. coccolobaefolia.
(1878). Q. macrophylla.
(1878). Q. simillima.
Y, 838, 838b. Q. potosina.
836. Q. orbiculata.
837. Q. stipularis,
839. Q. rugulosa.
1223. Q. dumosa.
Paul.
(1861). Q. mexicana.
Paul of Wuertemberg.
(1830). Q. oleoides.
(1830). Q. reticulata.
(1830). Q. xalapensis.
Pavon (probably cotypes of Née).
—— Q. candicans.
—— Q. crassipes.
—— Q. magnoliaefolia.
—— Q. mexicana.
—— Q. microphylla.
—— Q. peduncularis.
—— Q. Rossii.
—— Q. rugosa.
Peltier:
19. Q. stellata.
Philadelphia Academy.
(1845). Q. Humboldtii.
——, 2378. Q. oocarpa.
Pittier:
129, 131. Q. conspersa.
130. Q. barbanthera.
163. Q. purulhana.
408. Q. microphylla.
747, 871, 14120. Q. costaricensis.
773 pp., 2036 pp., 2037 pp. Q. Wesmaeli.
773 pp., 1789, 1818, 2607 pp. Q. oleoides.
1869, 1891. Q. corrugata.
2197, 7871 pp. Q. Pilgeriana.
2262. Q. eugeniaefolia.
5305. Q. Seemanni.
10553. Q. borucasana.
Polakowsky:
(1875). Q. corrugata.
Pringle:
(1881, 1884). Q. arizonica.
(1881). Q. hypoleuca.
(1881). Q. oblongifolia.

Pringle—Continued.
(1881, 1884, 1887), 2021. Q. diversicolor.
(1884). Q. Emoryi.
74, 355, 970. Q. chihuahuensis.
172, 353, 849. Q. undulata.
1361. Q. fulva.
1570. Q. aerea.
1571. Q. oblongifolia.
2095, 10225–6, 10379. Q. rysophylla.
2096, 2393, 10155, 11705. Q. Canbyi.
2099, 10224, 11332. Q. fusiformis.
2102, 3325, 10200. Q. polymorpha.
2112. Q. Duraznillo.
2382, 3702, 10199,13609. Q. Pringlei.
2802. Q. carnerosana.
2862, 3701, 13286. Q. intricata.
2884. Q. porphyrogenita.
3494. Q. germana.
3955, 8001, 8839. Q. candicans.
3969. Q. substenocarpa.
4116. Q. transmontana.
4760. Q. Poculifer.
4762. Q. peduncularis.
4843. Q. glaucophylla.
4913, 13295. Q. ocoteaefolia.
5356. Q. furfuracea.
5357, 6220. Q. macrophylla.
5988, 7072. Q. panduriformis.
6029. Q. impressa.
6277. Q. Radlkoferiana.
6670, 6997. Q. crassipes.
7540, 10394–5, 13976. Q. centralis.
7807. Q. chinantlensis.
7879, 8841. Q. conjungens.
8108. Q. xalapensis.
8840, 11851. Q. uruapanensis.
8854. Q. Praineana.
8888. Q. trinitatis.
8908. Q. subavenia.
8966. Q. revoluta.
9810. Q. crassifolia.
10008. Q. acherdophylla.
10120. Q. Loeseneri.
10227. Q. hypoxantha.
10290. Q. mexicana.
10295. Q. rugulosa.
10303. Q. subtriloba.
10308, 13855. Q. repanda.
10309. Q. microphylla.
10315. Q. Bourgaei.
11332. Q. sillae.
11851, 13829. Q. Hahnii.
13610. Q. conglomerata.

Purdie:
660. Q. Humboldtii.

Purpus:
(1912). Q. xalapensis.
(1913), 6166. Q. oleoides.
(1914). Q. calophylla.
(1914). Q. vexans.
697, 7386. Q. insignis.
1137. Q. intricata.
1233. Q. deserticola.

Purpus—Continued.
1794. Q. Purpusi.
1795. Q. conglomerata.
1796, 1798. Q. Radlkoferiana.
1797. Q. roseovenulosa.
2093, 4940, 6167. Q. polymorpha.
2302. Q. Sartorii.
2759. Q. Grahami.
2760. Q. microphylla.
4088. Q. chicamolensis.
4089. Q. lanigera.
4090. Q. glaucoides.
4091. Q. alveolata.
4939. Q. Eduardi.
4941. Q. prinopsis.
5029–30. Q. invaginata.
5332. Q. esperanzae.
6402. Q. Galeottii.
6997. Q. boqueronae.
6998, 7000. Q. cyclobalanoides.
6999. Q. chiapasensis.
7385. Q. excelsa.

Rangel:
2935 bis. Q. Purpusi.
5924 bis. Q. crassipes.

Rathsack:
—— Q. decipiens.
10, 492. Q. calophylla.
1109. Q. furfuracea.

Reeves.
(1918). Q. Reevesii.
1–3, 5, 6, 8–10. Q. chiapasensis.
4. Q. crispifolia.
7. Q. incrassata.
11. Q. Pilarius.

Reko.
3121. Q. Rekonis.

Robredo & Esquerra.
(1792). Q. lobata.

Rodriguez.
3636. Q. grandis.

Rose.
(1897). Q. bipedalis.
(1897). Q. exaristata.
(1897). Q. tepicana.
(1897), 1648, 1970. Q. planipocula.
(1897), 2188, 3001. Q. macrophylla.
(1897), 2224, 2693, 3024, 3655. Q. Eduardi.
(1897), 2999, 3446. Q. candicans.
1643. Q. aristata.
1644. Q. circinata.
1757. Q. glaucescens.
1758. Q. coffeaecolor.
1971. Q. botryocarpa.
2031, 2958. Q. bolanyoensis.
2177, 2733. Q. striatula.
2223, 3449, 3457–8. Q. Rosei.
2230. Q. radiata.
2231. Q. aequivenulosa.
2239. Q. subspathulata.
2590. Q. Praeco.
2685–6. Q. jaliscensis.
2721, 2735, 2806, 2998, 3726. Q. rhodophlebia.

Rose—Continued.
2960. Q. pallescens.
3363. Q. haematophlebia.
3398, 3732. Q. Rossii.
16013. Q. tomentella.
—— & Hay.
5675. Q. mexicana.
—— Painter & Rose.
8437. Q. crassifolia.
8438. Q. centralis.
8439. Q. crassipes.
8860. Q. texcocana.
9030. Q. opaca.
9197. Q. microphylla.
9664. Q. deserticola.
9720. Q. nitidissima.
—— Standley & Russell.
12787. Q. albocincta.
12788. Q. infralutea.
12789. Q. Standleyi.
13089. Q. perpallida.
Ross.
159, 172. Q. centralis.
176, 184, 1254. Q. conglomerata.
190. Q. crassipes.
245, 497. Q. panduriformis.
256. Q. malifolia.
250. Q. magnoliaefolia.
374, 505, 516. Q. Rossii.
376. Q. fulva.
378. Q. ocoteaefolia.
512. Q. candicans.
519. Q. obtusata.
534. Q. acutifolia.
583, 595. Q. polymorpha.
589. Q. xalapensis.
591. Q. oleoides.
656. Q. Martensiana.
Rothschuh.
611. Q. matagalpana.
Rovirosa.
1028. Q. oleoides.
Rusby.
(1881), 385. Q. hypoleuca.
(1910). Q. chartacea.
308. Q. subturbinella.
387. Q. Emoryi.
Russell. (*See* Rose.)
Salazar. (*See* Montes.)
Sargent. (*See* Canby; Engelmann.)
(1877, 1887). Q. breviloba.
(1887, 1900). Q. Canbyi.
(1887, 1900). Q. fusiformis.
(1887, 1900). Q. polymorpha.
(1894). Q. arizonica.
(1894). Q. Emoryi.
(1900). Q. porphyrogenita.
Sartorius.
—— Q. polymorpha.
1301. Q. Sartorii.
1302. Q. oleoides.
1305. Q. xalapensis.
1306. Q. Cortesii.
1309. Q. calophylla.
Schaffner.
266–7, 897 pp. Q. repanda.
896. Q. crassifolia.
897 pp. Q. miguelitensis.
899. Q. prinopsis.
Schenck.
90. Q. microphylla.
91. Q. esperanzae.
92, 236. Q. cancellata.
93. Q. affinis.
94. Q. glabrescens.
95. Q. conglomerata.
235. Q. mixtecana.
237. Q. glaucoides.
238. Q. Schenckiana.
239. Q. ceripes.
240. Q. Poculifer.
241. Q. Grahami.
693–4. Q. Martensiana.
695, 908. Q. crassifolia.
696. Q. xalapensis.
Scherzer.
—— Q. tristis.
(1853). Q. amphioxys
(1853). Q. callosa.
(1853). Q. citrifolia.
(1854). Q. Scherzeri.
Schiede.
—— Q. reticulata.
(1828–9), 14, 23. Q. oleoides.
(1829), 15, 22. Q. lancifolia.
(1829), 16. Q. circummontana.
17, 1379. Q. mexicana.
18 pp. Q. affinis.
18 pp. Q. xalapensis.
20, 501b. Q. polymorpha.
21, 596. Q. germana.
24, 597. Q. calophylla.
598. Q. chinantlensis.
1095. Q. Martensiana.
1110. Q. crassifolia.
Schmitz.
—— Q. Bonplandiana.
—— Q. rugosa.
184. Q. conglomerata.
566, 598–9. Q. crassipes.
775. Q. mexicana.
776. Q. castanea.
Schott.
(1855). Q. hypoleuca.
3d. Q. Emoryi.
Schumann.
1310, 1313. Q. chihuahuensis.
1311. Q. Eduardi.
1312. Q. macrophylla.
1316. Q. jaralensis.
Schuut.
—— Q. arizonica.
Seaton.
230. Q. floccosa.
232. Q. decipiens.
Seemann.
(1849). Q. bumelioides.
1130, 1230, 1572. Q. cocarpa.

Seemann—Continued.
1228. Q. Seemanni.
1456. Q. pinalensis.
1457. Q. nudinervis.
1458. Q. aristata.
1966. Q. albocincta.
1967. Q. laxa.
1968, 1998. Q. pennivenia.
1969. Q. omissa.
1970, "2970." Q. tuberculata.
1971, 1976. Q. obscura.
1972. Q. resinosa.
1973. Q. fulva.
1974. Q. salicifolia.
1975. Q. chiquihuitillonis.
Seler.
62, 1587, 1593–4, 1631, 1761, 1853. Q. chartacea.
63, 1484, 1595. Q. Grahami.
1483, 1757. Q. glaucoides.
1630. Q. uruapanensis.
1752. Q. glaucophylla.
2586. Q. barbanthera.
2667. Q. crispipilis.
2668. Q. callosa.
3067. Q. polymorpha.
4302. Q. Seleri.
Shafer.
11036, 11906, 11908, 11910. Q. virginiana.
—— & Leon.
13676. Q. virginiana.
Shear.
4223. Q. hypoleuca.
Sinclair.
(1845). Q. aristata.
Skinner.
(1845). Q. barbanthera.
1. Q. grandis.
2. Q. tristis.
3, 5. Q. corrugata.
6. Q. sapotaefolia.
Smith.
—— Q. Emoryi.
—— Q. hypoleuca.
—— Q. Toumeyi.
157. Q. malifolia.
776. Q. felipensis.
778. Q. zempoaltepecana.
779. Q. glaucoides.
948. Q. Grahami.
1709, 2630, 3154. Q. grandis.
1967. Q. Donnell-Smithii.
1968. Q. pilicaulis.
2186. Q. guatimalensis.
2189, 2628. Q. brachystachys.
Standley.
20187. Q. apanecana.
21593. Q. vicentensis.
Standley. (*See also* Rose.)
Sterrett.
6, 8. Q. stellata.
11. Q. alba.
Stone.
82, 85. Q. Martensiana.
137. Q. Hahnii.
139. Q. conglomerata.
Streator.
(1891). Q. imbricariaefolia.
(1891). Q. laurina.
Tejada.
209. Q. parviglans.
Thibaud herbarium.
(Supposedly from Née.)
—— Q. acutifolia.
—— Q. peduncularis.
Thieme.
5440. Q. hondurensis.
5615. Q. oleoides.
Thornber. (*See also* Griffiths.)
222. Q. oblongifolia.
266. Q. Emoryi.
Thurber.
—— Q. hypoleuca.
765. Q. Emoryi.
766. Q. arizonica.
Tonduz.
1953. Q. costaricensis.
7871. Q. Seemanni.
10788. Q. Tonduzii.
11697. Q. citrifolia.
11795, 12231. Q. rapurahuensis.
11827. Q. Wesmaeli.
17693. Q. oocarpa.
Torrey Herbarium.
(1851). Q. subturbinella.
Totten.
(1916). Q. stellata.
Toumey.
(1893–5), 2, 2850. Q. arizonica.
(1894), 174. Q. Toumeyi.
(1894), 271. Q. subturbinella.
(1894–5), 4, 282–3. Q. Emoryi.
(1894, 1896). Q. diversicolor.
(1894, 1896). Q. oblongifolia.
(1895). Q. hypoleuca.
160. Q. undulata.
Townsend & Barber.
361. Q. arizonica.
455 pp. Q. grisea.
455 pp. Q. oblongifolia.
Tracy & Earle.
211. Q. grisea.
Trelease. (*See also* Canby.)
28–30, 43–47. Q. brachystachys.
31, 56, 58. Q. tristis.
32–37, 39–42. Q. pilicaulis.
48–51. Q. callosa.
52–3. Q. conspersa.
54. Q. Donnell-Smithii.
55. Q. parviglans.
117, 118, 120. Q. porphyrogenita.
119. Q. fusiformis.
121. Q. Canbyi.

Triana.
829, 830. Q. Humboldtii.
Uhde.
4, 269, 270. Q. calophylla.
38, 47, 49, 265, 305–9. Q. deserticola.
266, 268, 272–5, 292, 297–8, 306. Q. rugosa.
267, 279, 300. Q. laurina.
271. Q. macrophylla.
276. Q. Uhdeana.
277, 310. Q. crassifolia.
278, 280–286. Q. barbinervis.
290, 303. Q. crassipes.
295. Q. Frutex.
296. Q. vallicola.
304. Q. castanea.
Van Hermann.
813, 3324, 7124. Q. virginiana.
Vasey.
(1880). Q. Palmeri.
Vaslit. (*See* Eisen.)
Vreeland.
685. Q. Vreelandii.
Wagner.
(1858). Q. bumelioides.
(1858). Q. Seemanni.
Ward.
——. Q. macrophylla.
v. Warscewicz.
A, 51–2. Q. oleoides.
C, C¹, 29. Q. eugeniaefolia.
1–3, 5–7, 23, 27, 28. Q. conspersa.
8. Q. parviglans.
9. Q. consociata.
10, 12, 14, 49. Q. tristis.
11, 38 pp. Q. corrugata.
15, 17–19, 30, 43. Q. pilicaulis.
20, 44 pp., 56. Q. grandis.
25. Q. correpta.
37. Q. guatimalensis.
40. Q. Skinneri.
41–2. Q. brachystachys.
44. Q. grandis and Q. oocarpa.
46–8. Q. acatenangensis.
50a. Q. oocarpa.
V. Warscewicz—Continued.
53, 275. Q. costaricensis.
Wendland.
658, 665. Q. costaricensis.
1265 pp. Q. eugeniaefolia.
1265 pp. Q. Seemanni.
Wetherill.
(1891). Q. subturbinella.
Wilcox.
(1891, 1894). Q. Emoryi.
1892, 1894). Q. arizonica.
(1892, 1894). Q. hypoleuca.
(1892–4). Q. oblongifolia.
(1894). Q. Toumeyi.
(1894). Q. undulata.
Wilkinson.
1855. Q. undulata.
Wilson.
(1916). Q. substellata.
Wislizenus.
(1846). Q. intricata.
234. Q. chihuahuensis.
Wolcott.
(1914). Q. almaguerensis.
Woodhouse.
—— Q. oblongifolia.
—— Q. subturbinella.
(1851). Q. undulata.
Woods.
(1910). Q. candicans.
Wooton.
(1895, 1901, 1905–6, 1909), 3046–7, 3049. Q. undulata.
(1895, 1902, 1906), 3859. Q. subturbinella.
(1899), A–C, E–G, I, 420, 3061. Q. arizonica.
315. Q. grisea.
3115. Q. Wootoni.
Wright.
(1868). Q. subturbinella.
(1869). Q. hypoleuca.
664. Q. undulata.
665. Q. grisea.
666. Q. Emoryi.
2292. Q. virginiana.
Wuertemberg. (*See* Paul of.)

B. OCCURRENCE BY COUNTRIES AND REGIONS.

CANADA.

Atlantic region
(Leucobalanus)
alba
bicolor
macrocarpa
montana
Muehlenbergii

Atlantic region—Continued
(Erythrobalanus)
borealis
coccinea
maxima
velutina

Pacific region
(Leucobalanus)
Garryana

UNITED STATES.

Atlantic region
(Leucobalanus)
alba
Andromeda
×Beadlei
×Bebbiana
bicolor

Atlantic region—Continued.
(Leucobalanus—Continued)
Boyntoni
Brayi
breviloba
Chapmani
×Deami

Atlantic region—Continued.
(Leucobalanus—Continued)
×Faxoni
×Fernowi
geminata
×Harbisonii
×Hillii

UNITED STATES—Continued.

Atlantic region—Continued.
(Leucabalanus—Continued)
×Jackiana
lyrata
macrocarpa
Margaretta
minima
montana
Muehlenbergii
prinoides
Prinus
×Saulii
×Schuettei
sinuata
stellata
virginiana
(Erythrobalanus)
×Ashei
×Benderi
borealis
×blufftonensis
×Brittoni
×Bushii
×caduca
×carolinensis
cinerea
coccinea
×dubia
×Egglestoni
ellipsoidalis
×exacta
georgiana
×Giffordi
×Hastingsii
×Hawkinsi
×heterophylla
ilicifolia
imbricaria
×Joorii
laevis
laurifolia
×Leana
×ludoviciana
marilandica
maxima
×Mellichampi
myrtifolia

Atlantic region—Continued.
(Erythrobalanus—Continued)
nigra
×oviedoensis
Pagoda
×palaeolithicola
palustris
Phellos
×podophylla
×Porteri
pumila
×Rehderi
×Richteri
×Robbinsii
rubra
×runcinata
×Rudkini
Shumardii
×Smallii
×sterilis
×subfalcata
×subintegra
×sublaurifolia
texana
×tridentata
velutina
×Walteriana
×Willdenowiana
Rocky Mountain region
(Leucobalanus)
Brayi
confusa
Eastwoodiae
Fendleri
Gambelii
Gunnisonii
Havardi
leptophylla
media
Mohriana
nitescens
novomexicana
obtusifolia
×organensis
pauciloba
Rydbergiana
submollis

Rocky Mountain region—Continued.
(Leucobalanus—Continued)
undulata
utahensis
venustula
Vreelandii
Chihuahuan region
(Leucobalanus)
grisea
Western Sierra Madre region
(Leucobalanus)
arizonica
diversicolor
oblongifolia
subturbinella
Toumeyi
(Protobalanus)
Wilcoxii
(Erythrobalanus)
Emoryi
hypoleuca
Eastern Sierra Madre region
(Leucobalanus)
fusiformis
sillae
Californian region
(Leucobalanus)
Douglasii
dumosa
durata
Engelmanni
Garryana
×jolonensis
lobata
Oerstediana
Sadleriana
(Protobalanus)
chrysolepis
tomentella
vaccinifolia
(Erythrobalanus)
agrifolia
Kelloggii
×moreha
Pricei
Wislizeni

MEXICO.

Pacific Islands
(Protobalanus)
tomentella
Desert region
(Leucobalanus)
Brandegei
dumosa
idonea
(Protobalanus)
Palmeri
(Erythrobalanus)
devia
peninsularis

Chihuahuan region
(Leucobalanus)
grisea
invaginata
jaralensis
Table-land region
(Leucobalanus)
alpescens
alvarezensis
ariaefolia
Bonplandiana
circinata
conjungens

Table-land region—Continued.
(Leucobalanus—Continued)
deserticola
diversifolia
glabrescens
macrophylla
microphylla
opaca
potosina
prinopsis
repanda
reticulata
rugosa

Mexico—Continued.

Table-land region—Continued.
(Leucobalanus—Continued)
subtriloba
texcocana
toxicodendrifolia
Uhdeana
(Erythrobalanus)
affinis
barbinervis
castanea
chrysophylla
coccolobaefolia
crassifolia
crassipes
depressa
dysophylla
errans
esperanzae
Hahnii
imbricariaefolia
lanceolata
laurina
malifolia
mexicana
miguelitensis
nitidissima
orbiculata
pulchella
roseovenulosa
rugulosa
sideroxyla
simillima
stipularis
tridens
trinitatis
Western Sierra Madre region
(Leucobalanus)
arizonica
aurantiaca
baldoquinae
bipedalis
chihuahuensis
circinata
conglomerata
convallata
crenatifolia
depressipes
diversicolor
durangensis
glaucescens
haemtaophlebia
Harmsiana
Hartmani
Hartwegi
infralutea
innuncupata
jaliscensis
laxa
lutea
macrophylla
magnoliaefolia
Western Sierra Madre region—Contd.
(Leucobalanus—Continued)
nudinervis
oblongifolia
obscura
obtusata
pallescens
panduriformis
peduncularis
perpallida
pinalensis
Praeco
resinosa
rhodophlebia
Sacame
Standleyi
striatula
subturbinella
Toumeyi
transmontana
tuberculata
undata
undulata
vellifera
(Erythrobalanus)
acapulcensis
acutifolia
aequivenulosa
aerea
alamosensis
albocincta
aristata
balsequillana
bolanyosensis
botryocarpa
campanariensis
candicans
chiquihuitillonis
coffeaecolor
colimae
Duraznillo
Eduardi
Emoryi
Endlichiana
epileuca
exaristata
fulva
hypoleuca
incarnata
Jonesi
Langlassei
moreliana
omissa
pennivenia
planipocula
Praineana
productipes
radiata
Rosei
Rossii
salicifolia
Western Sierra Madre region—Contd.
(Erythrobalanus—Continued)
Seleri
serrulata
Sipuraca
splendens
tahuasalana
tepicana
tlapuxahuensis
Urbani
uruapanensis
viminea
Eastern Sierra Madre region
(Leucobalanus)
chinantlensis
cordifolia
decipiens
excelsa
fusiformis
Galeottii
germana
Greggii
insignis
intricata
lancifolia
Lecomteana
leiophylla
Loeseneri
Martensiana
oleoides
polymorpha
porphyrogenita
Pringlei
sillae
strombocarpa
substenocarpa
(Erythrobalanus)
calophylla
Canbyi
Candolleana
carnerosana
circummontana
Cortesii
floccosa
Fournieri
Ghiesbreghtii
hypoxantha
Karwinskii
major
nectandraefolia
orizabae
perseaefolia
pubinervis
rysophylla
saltillensis
Sartorii
synthetica
totutlensis
vexans
xalapensis

MEXICO—Continued.

Cordilleran region
(Leucobalanus)
aculcingensis
alveolata
cancellata
centralis
ceripes
chartacea
conglomerata
Frutex
glaucophylla
Juergensenii
laeta
Liebmannii
manzanillana
mixtecana
peduncularis
Poculifer
Purpusi
Radlkoferiana
Rekonis
revoluta
Schenckiana
sororia
vallicola

Cordilleran region—Continued.
(Erythrobalanus)
acherdophylla
axillaris
Bourgaei
caeruleocarpa
chicamolensis
Conzattii
crassipes
cuajimalpana
felipensis
furfuracea
grandis
Grahami
huitamalcana
imbricariaefolia
impressa
lanigera
lingvaefolia
mexicana
oajacana
obovalifolia
ocoteaefolia
scytophylla

Cordilleran region—Continued.
(Erythrobalanus—Continued)
subavenia
subcrispata
tepoxuchilensis
tonaguiae
uruapanensis
zempoaltepecana
Central American region
(Leucobalanus)
barbanthera
boqueronae
callosa
cyclobalanoides
Pilarius
sebifera
(Erythrobalanus)
cerifera
chiapasensis
conspersa
crispifolia
crispipilis
incrassata
Skinneri

GUATEMALA.

Central American region
(Leucobalanus)
barbanthera
Barbeyana
callosa
corrugata
oleoides
oocarpa
pilicaulis
polymorpha
purulhana

Central American region—Contd.
(Leucobalanus—Continued)
Reevesii
(Erythrobalanus)
acatenangensis
Benthami
brachystachys
bumelioides
cinnamomea
consociata
conspersa

Central American region—Contd.
(Erythrobalanus—Continued)
correpta
crispipilis
Donnell-Smithii
flagellifera
grandis
guatimalensis
parviglans
Skinneri
tristis

BELIZE.

Central American region
(Leucobalanus)
oleoides

HONDURAS.

Central American region
(Leucobalanus)
callosa
oleoides
segoviensis

Central American region—Contd.
(Erythrobalanus)
hondurensis
Scherzeri

NICARAGUA.

Central American region
(Leucobalanus)
matagalpana
segoviensis

SALVADOR.

Central American region
(Leucobalanus)
arachnoidea
comasaguana
vincentensis

Central American region—Contd.
(Erythrobalanus)
amphioxys
apanecana

Central American region—Contd.
(Erythrobalanus—Continued)
gemmata
tristis

COSTA RICA.

Central American region
(Leucobalanus)
corrugata
oleoides
oocarpa
Pilgeriana
(Erythrobalanus)
amphioxys

Central American region—Contd.
(Erythrobalanus—Continued.)
borucasana
Brenesii
citrifolia
costaricensis
Endresi
eugeniaefolia

Central American region—Contd.
(Erythrobalanus—Continued.)
irazuensis
rapurahuensis
sapotaefolia
Seemanni
Tonduzii
Wesmaeli

PANAMA.

Central American region
(Leucobalanus)
oocarpa

Central American region—Continued.
(Erythrobalanus)
bumelioides
Seemanni

COLOMBIA.

Andean region
(Erythrobalanus)
almaguerensis
Humboldtii

Andean region—Continued.
(Erythrobalanus—Continued.)
Lindeni
tolimensis

CUBA.

Antillean region
(Leucobalanus)
virginiana

C. NAMES.

References to synonyms are in parentheses. Where several pages are referred to under one name, the principal reference is in black-faced type.

Apocynophyllum 30, 32.
Banksia 32.
Carpinus 28.
Castanea 18.
Castanopsis 18, 33.
Cerris 107, 108.
Dillenites 30.
Diospyros 26.
Dombeyopsis 31.
Dryandroides 27.
Dryophyllum 24, 28, 29, 30.
Fagopsis, 32.
Fagus 18.
Juglans 206, 213.
Mespilodaphne 27.
Myrcia 31.
Nectandra 29.
Nothofagus 18.
Pasania 18, 33.
Persea 27.
Platanus 31.
Protophyllum 30.
Quercus:
abnormalis (12, 26, 157).
acapulcensis 9, 153, pl. 302.
Acatenangenses 162.
acatenangensis 163, pl. 320.
acerifolia (194).
acherdophylla 183, pl. 357.
acrodon (26).
Quercus—Continued.
acroglandis (206).
aculcingensis 78, pl. 110.
acuminata (26, 110, 203).
—— Alexanderi (111).
acuta (196).
acutidens (117).
acutifolia (189, 190), 192, pl. 390, 391.
—— abrupta 192.
—— angustifolia 192.
—— Bonplandii 192.
—— conspersa (191).
—— furfuracea (189).
—— longifolia (163, 191).
—— microcarpa (153).
Acutifoliae 187.
acutiglandis (206).
aemulans 26.
aequivenulosa 138, pl. 261.
aerea 135, pl. 257.
Aereae 135.
affinis (26, 27, 60) 167, pl. 332, 333.
—— commutata 167.
—— subintegra 167.
agrifolia 9, 26, 206, pl. 420.
—— frutescens 206.
Agrifoliae 204.
Alamo (204).
Quercus—Continued.
alamosensis 179, pl. 361.
alaskana 26, 30.
alba 3, 4, 5, 7, 8, 11, 12, 13, 14, 15, 17, 22, 26, 31, 33, 34, 103, 105, 106, 108, 109, 110, 111, f. 7, pl. 8, 172–175.
—— Gunnisonii (99).
—— heterophylla 102, 103.
—— latiloba 102, 103.
—— longigemma 103.
—— microcarpa 102, 103.
—— minor (104).
—— palustris (108).
—— pinnatifida 103.
—— repanda 102, 103.
—— Ryderi 102, 109.
—— sublyrata 102, 103.
—— viridis 102.
Albae 102.
albocincta 193, pl. 394.
Albocinctae 193.
Alexanderi (111).
almaguerensis 141, pl. 268, 269.
alnoides 26.
alpescens 83, pl. 122.
alvarezensis 76, pl. 104.
alveolata 80, pl. 114.
Alvordiana (117).
ambigua (76, 195).

Quercus—Continued.
amphioxys 141, pl. 268.
anceps (26).
Andinae 141.
× Andrewsii 13, 96, 97, 108.
Andromeda 115, pl. 202.
—— nana 116.
angulizans (195).
angustiloba (26, 31, 34).
annulata (101).
antiqua 26.
apanecana 152.
Applegatei 26.
approximata 26.
aquatica (159).
—— dentata (159).
—— heterophylla (158).
—— hybrida (157).
—— laurifolia (156).
—— myrtifolia (157).
—— stipitata (159).
aprica (156).
arachnoidea 59, pl. 55.
Arachnoideae 59.
argentum 27.
ariaefolia 74, pl. 97.
aristata 139, pl. 265.
Aristatae 139.
arizonica 12, 16, 88, pl. 141.
—— Wootoni 89.
Arizonicae 87.
× arkansana 13, 200.
× Ashei 13, 156, 199, 200.
asymmetrica 27, 28.
× atlantica 13, 156, 157.
attenuata (27).
aurantiaca 57, pl. 53.
Aurantiacae 57.
aurea (201).
austrina (101).
axillaris 176, pl. 352.
baldoquinae 53, pl. 43.
balaninorum 27.
balsequillana 123, pl. 220.
Banisteri (197).
banksiaefolia 27.
barbanthera 9, 68, pl. 81.
—— calva 68.
Barbeyana 8, 67, pl. 76.
barbinervis 167, pl. 331.
Baueri 27.
× Beadlei 13, 103, 109, 110.
× beaumontiana 13, 157, 202.
× Bebbiana 13, 103, 108.
× Benderi 13, 195, 196.
—— coccinoides 13, 195, 196.
—— —— volvato-annulata 13, 195, 196.
—— rubrioides 13, 195, 196.
Benthami 146, pl. 284.
Benthamiae 146.
Benzoin (27).
berberidifolia (116).
Quercus—Continued.
bernardiensis (14, 15, 103).
Berryi 27.
bicolor 7, 15, 17, 22, 27, 31, 103, 105, 108, pl. 186.
—— angustifolia (108).
—— cuneiformis (109).
—— lyrata (109).
—— mollis 109.
—— platanoides (108).
Bicornes 25.
bicornis 27.
bipedalis 89, pl. 143.
× bladenensis (14).
× blufftonensis 14, 200, 202.
bolanyosensis 123, pl. 223.
Bonplandiana 76, pl. 103.
boqueronae 48, pl. 33.
Boqueronaeae 48.
borealis 16, 195, 197.
—— maxima (194).
borucasana 19, 161, pl. 315.
Borucasanae 160.
botryocarpa 150, pl. 295.
Bourgaei 165, 168, pl. 336.
—— ilicifolia 168.
Boweniana 27.
Boyntoni 9, 106, pl. 176.
brachystachys 8, 9, 130, pl. 238–240.
—— caerulea 130.
—— venulosa 130.
Brandegei 115, pl. 196, 197.
Brayi 109.
braziliensis (27).
Brenesieae 186.
Brenesii 186, pl. 377.
brevifolia (155).
breviloba (27), 101, pl. 170.
—— argentata 102.
—— Laceyi 102.
—— san-sabia 102.
Breweri (27, 100).
× Brittoni 14, 197, 199, 200.
bumeliaefolia (160).
bumelioides 149, pl. 291.
× Bushii 14, 199, 200.
× Byarsi 14, 108, 110.
× caduca 14, 156, 160.
caeruleocarpa 163, pl. 321.
Caeruleocarpae 163.
californica (27, 205).
callosa 3, 8, 9, 68, pl. 82.
calophylla 192, 203, pl. 409–416.
—— acuminata 203.
—— Alamo 204.
—— flavida 203.
—— intermedia 204.
—— Schiedeana 203.
—— Willdenovii 204.
Calophyllae 202.
calvertonensis 27, 30.
Quercus—Continued.
campanariensis 126, pl. 228.
Canbyi 188, pl. 379, 380.
—— ascendens 188.
—— Berlandieri 188.
cancellata 55, pl. 49.
Cancellatae 54.
candicans 204, pl. 417, 418.
—— incurva 204.
—— michoacana 204.
candida (103).
Candolleana 11, 191, pl. 387.
carbonensis 27.
carnerosana 183, pl. 369.
× carolinensis 14, 156, 200.
Carpenterii (202).
carpinifolia (109).
castanea (110), 114, (171), 175, 178, pl. 358, 359.
—— elliptica 178.
—— glabrata (154).
—— integra (173).
—— macrophylla (110).
—— mexicana (173).
—— sublobata (171).
—— tridens (171).
Castaneae 178.
Castaneopses 25.
castaneopsis 27.
castanoides 27.
castanopsis 27.
Catesbaei (200).
catesbaeifolia 27.
celastrifolia 27.
centralis 9, 61, 77, pl. 60.
—— heterophylla 62.
cerifera 184, pl. 370.
ceripes 93, pl. 150.
Cerris 5, 9, 19, 33, 35.
Chamissonis 27.
Chapmani 9, 27, 106, pl. 176.
chapmanifolia 27.
chartacea 61, pl. 59.
chiapasensis 186, pl. 375–377.
—— cuneifolia 186.
—— falcilobata 186.
—— flagellata 186.
—— longipes 186.
—— petiolata 186.
—— subcuneata 186.
chicamolensis 131, pl. 246.
Chihuahuenses 85.
chihuahuensis 85, pl. 129–131.
—— amplifolia 86.
—— microphylloides 86.
—— tenuis 86.
chinantlensis 46, pl. 28.
Chincapin (111).
Chinquapin (111).
chiquihuitillonis 139, pl. 264.
chlorophylla (26, 27).
chlorophylloides (27).
Chrysolepides 118.

Quercus—Continued.
chrysolepis 4, 6, 11, 25, 26, 27, 34, 118, pl. 9, 209, 210.
—— grandis 118.
—— Hanseni 118.
—— montana 27.
—— nana 118.
—— Palmeri (119).
—— pendula 118.
—— vaccinifolia (120).
chrysophylla (118), 170, pl. 340.
cinerea 9, 13, 14, 16, 17, 27, 155, 157, 160, 199, 200, 202, pl. 303.
—— dentato-lobata 156.
—— humilis (155).
—— nana (155).
—— pumila (155).
cinereoides 27.
cinnamomea 184, pl. 371.
Cinnamomeae 184.
circinata 65, pl. 71.
Circinatae 64.
circummontana 177, pl. 356.
citrifolia 19, 147, pl. 288
Citrifoliae 147.
clarnensis 27.
cleburni 27.
coccinea 7, 16, 158, 195, 196, 197, pl. 396.
—— ambigua (195).
—— microcarpa (195, 196).
—— nigrescens (198).
—— Rugelii (196).
—— tinctoria (198).
—— tuberculata 196.
—— vulgaris (196).
Coccineae 193.
coccolobaefolia 136, pl. 258.
Coccolobaefoliae 135.
Cockerellii (27).
× Cocksii 14, 157, 199.
coffeaecolor 137, pl. 261.
colimae 174, pl. 349.
—— Zauzillo 175.
coloradensis 27.
comasaguana 43.
commutata (167).
competens 27.
× Comptonae 13, 14, 106, 107, 109, 113.
confertifolia (124, 174).
confusa 97, pl. 161.
Confusae 96.
conglomerata 77, pl. 106.
conjungens 55, pl. 48.
consimilis 24, 27.
consociata 172, pl. 345.
Consociatae 172.
conspersa 191, pl. 388, 389.
—— caudata 192.
—— ovatifolia 192.
Quercus—Continued.
convallata 88, pl. 140.
convexa 27.
Conzattii 134, pl. 254.
cordata (52, 53).
cordifolia 84, pl. 125.
coriacea 27.
correpta 153, pl. 300.
corrugata 45, pl. 23, 24.
—— granulifera 45.
—— ipalensis 45.
—— microcarpa 45.
Corrugatae 44.
Cortesii 185, pl. 373.
corticosa 35.
Costaricenses 145.
costaricensis 145, pl. 281–283.
—— Kuntzei 146, 149.
crassifolia 128, pl. 234.
Crassifoliae 128.
crassinervis (28).
crassipes 11, 175, pl. 350, 351.
—— angustifolia (174).
crassipocula (118)
crenatifolia 57, pl. 52.
crispata 84.
crispifolia 147, pl. 286.
Crispifoliae 146.
Crispipiles 183.
crispipilis 184, pl. 370.
Crossii 28.
cuajimalpana 165, pl. 324.
cubana (113).
Culveri 28.
cuneata (28, 30, 200, 201).
—— falcata (202).
cuneifolia (46, 112).
cuspidata (28).
Cyclobalanoideae 44.
cyclobalanoides 11, 44, pl. 20, 21.
Cyclobalanopsis 35.
dakotensis 28.
Dallieae 25.
Dallii 25, 28.
Dawsoni 28, 31.
dayana 28.
× Deami 14, 103, 109, 111.
decipiens 8, 77, pl. 106, 107.
densiflora (19).
dentata (159).
Dentoni 28.
dentonoides 28.
depressa 169, pl. 337, 338.
Depressae 169.
depressipes 90, pl. 144.
deserticola 9, 79, pl. 113, 114.
—— incisa 80.
Deserticolae 79.
devia 124, pl. 224.
digitata (28, 201).
dilatata (105, 199).
Quercus—Continued.
discolor (198, 201).
—— Banisteri (197).
—— bicolor (109).
dispar 35.
distincta 28, 32.
Distinctae 25.
diversicolor 73, pl. 92-94.
—— Mearnsii 74.
—— socorronis 74.
diversifolia 79.
doljensis 28.
Donnell-Smithii 162, pl. 318.
Douglasieae 111.
Douglasii 15, 33, 100, 111, 117, pl. 188.
—— Gambelii (99).
—— Neaei (100).
—— novomexicana (99).
—— Ransomii (111).
Drummondii (105).
drymeja 28.
dryophyllopsis 28.
× dubia (13), 14, (27), (28), 198.
dumosa 5, 33, 112, 116, pl. 203–208.
—— acutidens 117.
—— Alvordiana 117.
—— berberidifolia 116.
—— bullata (116).
—— crispata 117.
—— diversifolia 117, pl. 204, 205.
—— insularis 117.
—— linearis 117.
—— longigemma 117.
—— MacDonaldi 117.
—— microcarpa 117.
—— munita (117).
—— myrtifolia 117.
—— polycarpa (117).
—— populifolia 117.
—— revoluta (116).
—— turbinella 117, pl. 206.
Dumosae 34, 116.
Dunnii (119).
Durandieae 101.
Durandii (7, 101, 200).
—— austrina (101).
durangensis 73, pl. 91.
durata 116.
Duraznillo 122, pl. 220, 221.
—— bullata 123.
—— cochutensis 123.
—— pinetorum 123.
durifolia 121, pl. 218.
Durifoliae 120.
durinus 35.
duriuscula 28.
dysophylla 132, pl. 250, 251.
Eamesi 28, 32.
Eastwoodiae 98, pl. 162.
echinacea=Pasania.

Quercus echinoides=Pasania.
Eduardi 121, pl. 219.
—— cespitifera 121.
× Egglestoni 14, 156, 193, 194.
elaena 26, 28.
elaenoides 28.
elkoana (28).
ellipsoidalis 7, 11, 16, 22, 158, 196, 198, pl. 396.
—— coronata 196.
—— depressa 196.
—— heterophylla 196.
—— incurva 196.
—— intermedia 196.
elliptica (28, 32, 149).
Ellisiana 28, 30.
Ellsworthiana 28.
elongata (201).
Emoryi 12, 94, 96, 120, pl. 9, 216, 217.
Endlichiana 141, pl. 267.
Endresi 145, pl. 280.
Endresiae 145.
Engelmanni 11, 91, 117, pl. 144.
eoprinoides 28.
epileuca 126, pl. 229.
errans 131, pl. 245.
Erythrobalanus 35, 38, 120.
esperanzae 132, pl. 248.
eucalyptifolia 27, 28.
eugeniaefolia 161, pl. 316.
—— petiolata 161.
Eugeniaefoliae 161.
Evansii 28.
× exacta 14, 156, 158.
exaristata 140, pl. 266.
excelsa 47, pl. 29, 30.
Excelsae 46.
eximea (116).
eximia (28).
× falcata (14, 17, 158).
falcata (201).
—— ludoviciana (201)
—— pagodaefolia (202).
—— subintegra (17, 156, 202).
—— triloba (201).
× Faxoni 14, 103, 111.
felipensis 129, pl. 237.
Fendleri 97, pl. 159.
× Fernaldi 15, 195, 197.
× Fernowi 15, 103, 105, 109.
ferruginea (105, 177, 199).
—— hybrida (14).
filiformis (109).
Finax (112).
Fisheriana 28.
flagellifera 162, pl. 319.
flammula (7, 200).
flava (66).
flavida (203).
flexuosa 28.
floccosa 127, pl. 232.
Floccosae 127.
floridana (105).
Quercus florissantensis 28, 31.
Fournieri 177, pl. 357.
Fournieriae 177.
fraxinifolia 28, 29.
Fraxinifoliae 25.
Fremontii 108.
Frutex 82, pl. 120.
—— Uhdeana 83.
fulva 129, pl. 235, 236.
fulvescens (118).
furcinervis 28.
furfuracea 189, pl. 382.
Furuhjelmi 28
fusca (105).
fusiformis 114, pl. 195.
Galeottii 45, pl. 25, 26.
Gambelieae 34, 97.
Gambelii 99, pl. 158.
—— Gunnisonii (99).
Gambellii (99).
Gardneri 28.
Garryana 26, 100, 112, pl. 167, 168.
—— Breweri (100).
—— Jacobi (100)
—— semota 100.
Gaudini 29.
geminata 15, 106, 115, pl. 198–200.
—— grandifolia 112, 115.
—— maritima 112, 115.
—— Rolfsii 112, 115.
—— succulenta 112, 115.
gemmata 152, pl. 299.
georgiana 9, 17, 159, 200, pl. 307.
germana 51, pl. 40.
—— echinata 52.
—— Lemmoni 52.
Germanae 51.
Ghiesbreghtii, 163, pl. 321, 322.
× Giffordi 15, 157, 197.
glabrescens 49, pl. 34.
—— integrifolia 49.
Glabrescentes 48.
glascoena 29.
glauca (54).
glaucescens 55, pl. 50.
Glaucescentes 55.
Glaucoideae 52.
glaucoides 9, 52, pl. 42, 43.
glaucophylla 53, pl. 44, 45.
—— tlacolulana 53.
Glennii 26, 29.
Godeti 29.
Goepperti 29.
goldiana 29.
gonoloba (105).
gracilis (29).
Grahami 190, pl. 383, 384.
—— brevipes 190.
—— coyulana 190.
—— Nelsoni 190.
Grandes 184.
Quercus grandifolia (131).
grandis 43, 185, pl. 372, 373.
—— tenuipes 185.
granulata (109, 161).
Greggii 78, pl. 109.
grisea 12, 16, 26, 89, 94, 121, pl. 152.
Griseae 94.
groenlandica 29.
grossidentata 29.
× guadalupensis 15, 105, 108.
Guatimalenses 152.
guatimalensis 153, pl. 300.
Gunnisonii 99, pl. 166.
hæmatophlebia 7, 66, pl. 74.
Hahnii 131, pl. 247.
Haidingeri 29.
× Harbisonii 15, 106, 115.
Harmsiana 54, pl. 45.
Hartmani 95, pl. 154.
Hartwegi 69, pl. 84.
hastata (120).
× Hastingsii (15, 195, 200).
Hatcheri 27, 29, 30.
Havardi 97, pl. 160.
× Hawkinsi 15, 195, 199.
Haydeni 29.
hemisphaerica (160).
—— nana (159).
hesperia 29.
Heterobalanus 35.
heteroloba (105).
heterophyla (112).
× heterophylla 15, 158, 193, 195.
hexagona 29.
hieracifolia, 29.
× Hillii 15, 107, 108, 111.
Hindsii (100).
Hollickii 29.
× Hollickii (15, 158, 195).
Holmesii 29.
hondurensis 140, pl. 266.
Horniana 29.
Hosiana 29.
huitamalcana 185, pl. 374.
Huitamalcanae 185.
Humboldtii 33, 142, pl. 272, 273.
—— Lehmanniana 142.
humilis (155).
Hussakii (29).
hybrida (16, 157).
—— Kentonii (17, 108).
hypoleuca 124, (125), pl. 226.
Hypoleucae 124.
hypophlaeos (201).
hypoxantha 170, pl. 339.
Hypoxanthae 170.
idahoensis 29.
idonea, 56, pl. 51.
Ilex 33 (115).
ilexoides (112).
ilicifolia 14, 15, 16, 26, 157, 196, 197, 199, 200, pl. 397.
Ilicifoliae 196.

Quercus imbricaria 9, 10, 14, 15, 16, 17, 26, 29, **156**, 158, 195, 198, 200, f. 4, pl. 303.
—— fossilis 156.
—— spinulosa 156.
imbricariaefolia 174, pl. 348.
impressa 181, pl. 364.
Impressae, 180.
incana (113).
incarnata 126, pl. 229–231.
—— ampla 127.
—— grosse-serrata 127.
—— longa 127.
incrassata 147, pl. 287.
infectoria 154.
infralutea 87, pl. 136.
innuncupata 77, pl. 108.
Insignes 42.
insignis 5, 11, **42**, (44), pl. 14–16.
—— strombocarpoides (42).
intermedia (204).
intricata **84**, 90, pl. 126–128.
—— angusta 85.
—— erratica 85.
—— ovata 85.
Intricatae 84.
invaginata 11, **87**, pl. 137, 138.
—— Purpusiana 87.
Invaginatae 87.
irazuensis 144, pl. 278.
× Jackiana 15, 102, 103, 109.
Jacobi (100).
jaliscensis 86, pl. 132.
jaralensis 86, pl. 133, 134.
—— Berlandieri 86.
Johnstrupi 29.
× jolonensis 15, 100, 112.
Jonesi 136, pl. 257.
× Joorii 15, 193, 194, 202.
judithae 29.
Juergensenii 50, pl. 38.
Juergensii (50).
Jurgensenii (50).
kanseana 29.
Karwinskii 188, pl. 379.
Kelloggii 205, pl. 419.
—— cibata 205.
Knowltoniana 29.
Laceyi (102).
lacta 70, pl. 86, 87.
—— heterophylla 71.
Lactae 70.
laevigata 9, 11.
laevis 7, 13, 14, 16, 17, 156, 157, 160, **200**, 202, pl. 404, 405.
—— linearifoloba 200.
—— Rappii 200.
Laharpi (29).
Lambertenses 25.
lambertensis 29.
lanceolata 26, **165**, pl. 326.
—— undulato-dentata (168).
Quercus Lanceolatae 164.
lancifolia 48, pl. 32.
—— monocarpa (47).
—— pilosiuscula 48.
Lancifoliae 47.
Langlassei 138, pl. 263.
Langlasseiae 138.
lanigera 176, pl. 354, 355.
—— sideroxyloides 177.
Lanigerae 176.
lanuginosa 179.
laramiensis 28, 29.
latifolia (28, 29).
laurifolia 9, 13, 16, 29, (29, 30), **156**, 200, pl. 304–306.
—— acuta (156).
—— dentata 157.
—— hybrida 157.
—— obovatifolia 157.
—— obtusa (157).
—— rhombica 13, 14, **157**, 199, 202.
—— tridentata 157.
Laurifoliae 154.
lauriformis 26.
laurina 26 (156, 157), **166**, pl. 327–329.
—— barbinervis (167).
—— major (166).
—— ocoteaefolia (168).
—— podocarpa (168).
laurosimulans (30).
laxa 9, 60, **70**, pl. 85.
Laxae 69.
× Leana 15, 156, 194, 198.
Lecomteana 81, pl. 115.
Lecomteanae 80.
Lehmannii 29.
leiophylla 47, pl. 31.
leptophylla 98, pl. 163.
Lesquereuxiana 29.
Leucobalanus 35, 41.
leucophylla (202).
Liebmannii 66, pl. 75.
—— brevipes 67.
Limnodrys 158.
Lindeni 143, pl. 274.
linguaefolia (148).
linguaefolia 148, pl. 290.
linifolia.
liriodendroides 26.
lobata 15, **100**, 112, pl. 168.
—— argillosa 100.
—— Breweri (100).
—— fruticosa (100).
—— Hindsii (100).
—— insperata 100.
—— rarita 100.
—— Walterii 100.
Lobatae 25, 99, 106.
lobulata (105).
Loeseneri 79, pl. 110.
Lonchitis 29.
Quercus longifolia (109, 163).
longiglanda (100).
× Lowellii (16, 195, 197).
× ludoviciana 16, 158, 193, 199, 202.
lutea 66, pl. 73.
lutescens (114).
Lyellii (29).
lyrata 7, 9, 10, 11, 14, 17, 29, **106**, 113, pl. 183.
—— viridis 106.
Lyratae 37, 106.
lyratiformis 29.
MacDonaldi (117).
—— elegantula (117).
macrocarpa 3, 5, 7, 10, 11, 13, 14, 15, 17, 26, 30, 96, 103, 105, **107**, (108), 109, 110, 111, f. 2, 3, 5, pl. 2, 184, 185.
—— abbreviata 107, 108.
—— appressa 107, 108.
—— depressa 107, 108.
—— explanata 107.
—— Fisherii 108.
—— MacClarenii 108.
—— minor 107, 108.
—— monstrosa 108.
—— muscosa 107, 108.
—— olivaeformis 107, 108.
—— orbiculata 107.
Macrocarpae 107.
Macrocarpaca 42.
macrophylla 5, 9, **63**, (65), pl. 65–67.
—— rugosa (75).
Macrophyllae 63.
magnifolia 30.
Magnifoliae 25.
magnoliaefolia 9, **65**, pl. 72.
—— lutea (66).
—— macrophylla (63, 64).
magnolifolia (65).
major 166, pl. 330.
malifolia 175, pl. 348.
manzanillana 80, pl. 116.
Marcyana (24, 30, 110).
Margaretta 15, 16, 105, **106**, 115, pl. 176.
—— araniosa 104, 106.
—— intermedia 104, 106.
—— paludosa (105).
—— Peltieri 104, 106.
—— stolonifera 104, 106.
marilandica 13, 14, 15, 16, 17, 22, 30, 34, 156, 157, 159, 160, 195, 197, **199**, pl. 400–403.
—— aequilobata 199
—— Ashei 200.
—— cuneata 199, 200.
—— incisa 199.
—— integrifolia 199, 200.
—— obovata 199.

Quercus marilandica paucidentata 199.
—— quinqueloba 199, 200.
—— sublyrata 199.
—— subquinqueloba 199.
—— subtypica 199.
—— truncata 199.
Marilandicae 199.
Martensiana 9, **60**, pl. 56, 58.
—— Berlandieri 60.
—— perplexans 60.
matagalpana 58, pl. 54.
maxima 4, 7, 9, 11, 15, 22, 30, 156, 158, **195**, 196, 199, pl. 395.
media 99, pl. 161.
mediterranea (30).
× Mellichampi 16, **157**, 193, 194, 199, 200.
Merriami 30, 31.
mexicana 173, pl. 345–347.
—— angustifolia 174.
—— Bonplandi 174.
—— confertifolia 174.
—— glabrata (154), 174.
—— lanosa 174.
—— perfertilis 174.
Mexicanae 173.
Michauxii (30, 110).
microcarpa (152, 160).
microcarya (160).
microdentata (30).
microphylla 82, pl. 119.
—— crispata (84).
Microphyllae 82.
miguelitensis 132, pl. 249.
Milleri (30).
minima 115, pl. 200, 201.
—— pygmaea 112, 115.
—— Reasoneri 112, 115.
minor (30, 105).
—— Margaretta (106).
missouriensis (198).
mixtecana 54, pl. 46.
Mohriana 90, pl. 143.
mollis (109, 131).
montana 16, 17, 22, (30), 103, **110**, pl. 187.
montanensis 30.
monticola (110).
Moorii (30).
× moreha 16, 205, 206.
moreliana 130, pl. 241.
Morehus (16, 205, 206).
Morrisoniana 30.
mucronata (175, 178, 204).
Mudgii (30).
Muehlenbergii 3, 14, 15, 30, 103, 108, (109), **110**, pl. 187.
—— Alexanderi 109, 111.
—— Brayi (109).
—— humilis (111).
—— stellulata 109.
multinervis 30,
Quercus Myricifoliae 25.
myrtifolia 13, 16, (30), 156, **157**, pl. 303.
—— ampla 157.
nana (9, 159, 197).
Neaei (100).
nectandraefolia 148, pl. 289.
Nectandraefoliae 147.
negundoides 25, 30.
neomexicana 30.
neriifolia (25, 30).
nevadensis 30.
Newberryi 28, 30.
nigra 2, 9, 11, 13, 14, 17, 22, 30, 156, **159**, (198), 199, 200, pl. 308–314.
—— aquatica (159).
—— digitata (201).
—— hemisphaerica 160.
—— ilicifolia (197).
—— integrifolia (200).
—— megacarpa 160.
—— microcarya 160.
—— plenocarpa 160.
—— pumila (197).
—— quinqueloba (200).
—— saxicola 160.
—— tridentata (17, 156, 200).
—— tridentifera 159.
Nigrae 159.
nigrescens 35.
nitens 60 (167).
—— major (166).
—— ocoteaefolia (168).
—— podocarpa (168).
—— subintegra (167).
nitescens 99, pl. 164.
nitida (112, 143).
nitidissima 122, pl. 218.
Nitidissimae 122.
nobilis (199, 201).
novae-caesareae 30.
novi-orleani (159).
novomexicana 99, pl. 164, 165.
—— Andrewsi 99.
nudinervis 65, pl. 70.
oajacana 150, pl. 294.
Oajacanae 149.
oblongifolia 91, pl. 145, 146.
—— pallidinervis 91.
Oblongifoliae 90.
obovalifolia 175, pl. 351.
obscura 71, pl. 88, 89.
—— perpusilla 71.
Obscurae 71.
obtusa (157).
obtusata 62, pl. 61, 62.
—— Hartwegi (65, 69).
—— pandurata 62.
obtusifolia 98, pl. 162.
—— breviloba (101).
obtusiloba (30, 105).
—— depressa (108).
—— parvifolia (106).
Quercus occidentalis (30, 32).
ocotaefolia (168).
ocoteaefolia 168, pl. 334, 335.
—— confusa 168.
—— podocarpa 168.
Oerstediana 100, pl. 168.
Olafseni 30.
oleoides 23, **113**, pl. 191–194.
—— australis 114.
—— lutescens 114.
oligodes (112).
oligodonta 34 (121).
Oligodontae 121.
olivaeformis (108).
omissa 127, pl. 231.
oocarpa 26, **43**, 185, pl. 18.
Oocarpae 43.
opaca 92, pl. 148.
Opacae 92.
orbiculata 132, pl. 249.
× organensis 16, 89, 94.
oregoniana 30.
orizabae 127, pl. 233.
Orizabaeae 127.
Osbornii 30.
× oviedoensis 16, 156, 157.
oxyadenia (206).
Pachyphyllae 147.
pacifica 30.
Pagoda 16, 158, 202, pl. 407, 408.
—— calva 201.
—— cocciniaefolia 201.
—— incurva 201.
—— intermedia 201.
—— juvenilis 201.
—— leucophylla 201, 202.
—— sinuata 201.
pagodaefolia (202).
Pagodaefoliae 200.
Palaeo-Ilex 33, 34.
× palaeolithicola 16, 194, 196, 198.
pallescens 89, pl. 141.
Palmeri 119, pl. 213, 214.
paludosa (108).
Palustres 158.
palustris 3, 6, 7, 9, 11, 14, **16**, 26, 30, 156, **158**, 195, f. 1, 6, pl. 1, 10, 307.
—— heterophylla (15, 158, 195).
pandurata (26, 30, 62, **105**, 106).
—— Hartwegi (69).
—— laeta (70).
Panduratae 62.
panduriformis 62, pl. 62, 63.
—— colimensis 63.
—— rubrinervis 63.
pannosa (109).
Parviglandes 151.
parviglans 3, **152**, pl. 298, 299.
—— polycarpa 152.
—— Tejadana 152.

Quercus parvula (206).
paucidentata 24, 30.
Paucidentatae 25.
pauciloba 97, pl. 160.
payettensis 30.
Pealei 30.
Pedunculares 67.
peduncularis 69, pl. 83, 86.
pedunculata 4, 16, 33, 108, 127, 200.
Penhallowi 29, 30.
Peninsulares 124
peninsularis 124, pl. 225.
pennivenia 135, pl. 256.
Penniveniae 134.
peritula 30.
perpallida 91, pl. 147.
perseaefolia 149, pl. 291.
—— microcarpa 149.
Perseaefoliae 148.
× petiolaris (16, 50, 156, 199).
Phellodrys 154.
Phellos 4, 9, 12, 14, 15, 16, 17, 22, 26, 31, (113, 155), 157, 160, 195, 197, 198, 200, 202, pl. 8, 303.
—— arenaria (157).
—— brevifolia (155).
—— humilis (155).
—— imbricaria (156).
—— latifolia (155).
—— laurifolia (155).
—— obtusifolia (113).
—— pumila (155).
—— sempervirens (113).
—— sericea (155).
—— subimbricaria (16, 158).
—— sylvatica (157).
Pilarius 44, pl. 19.
Pilgeriana 46, pl. 27.
pilicaulis 3, 67, pl. 3, 4, 77–80.
—— armata 68.
—— Hurteri 68.
—— macrodonta 68.
—— obovalis 68.
pinalensis 46, pl. 28.
Pittieri (172).
planipocula 11, 136, pl. 259.
—— subsessilifolia 137.
Planipoculae 136.
platania (31).
platanoides (31, 109).
platinervis 31.
plenocarpa (160).
Poculifer 64, pl. 69.
Poculiferae 64.
× podophylla 16, 156, 199.
polymorpha 23, 50, (56), pl. 36–38.
Polymorphae 49.
poranoides 31.
porphyrogenita 51, pl. 39.
Quercus × Porteri 16, 194, 195, 199.
potosina 84, pl. 123–125.
—— aperta 84.
—— exilis 84.
Potosinae 83.
prae-angustiloba 26, 31.
Praeco 88, pl. 139.
prae-dumosa 31, 32.
prae-mespilifolia (31).
prae-undulata 31, 32.
Praincana 138, pl. 262.
Praincanae 137.
Pratti 31.
predigitata (31, 201).
previrginiana (31, 113).
Pricei 206, pl. 420.
primordialis 31.
Pringlei 91, pl. 148.
Prinoideae 109.
prinoides 3, 14, 22, 31, 103, 111, pl. 187
—— rufescens 111.
Prinopses 59.
prinopsis 61, pl. 58.
Prinus 13, 14, 30, 31, 103, 108, 110, pl. 187.
—— acuminata (110).
—— bicolor (108).
—— Chincapin (111).
—— discolor (108).
—— humilis (111).
—— monticola (110).
—— palustris (110).
—— platanoides (108).
—— pumila (111).
—— tomentosa (108).
—— viridis 110.
productipes 140, pl. 264.
Protobalanus 35, 38, 118.
pseudo-alba (26, 31, 103).
pseudo-alnus 25, 31.
pseudo-castanea 31.
pseudo-chrysophylla 31.
pseudo-daphnes (31).
pseudo-lyrata 31.
—— acutiloba 31.
—— angustiloba (31).
—— brevifolia 31.
—— latifolia 31.
—— obtusiloba 31.
× pseudomargaretta 16, 104, 105, 106.
pseudo-westfalica 31.
pubinervis 150, pl. 294.
pulchella 179, pl. 360.
pumila 155, (197), pl. 303.
—— sericea (155).
pungens (12, 96, 121).
Purpusi 76, pl. 105.
purulhana 63, pl. 64.
pyrifolia (31).
quinqueloba (200).
Racemiflorae 133.
Quercus radiata 134, pl. 253.
Radlkoferiana 49, pl. 35.
Ramaleyi 31.
Ransomii (111).
Rapurahuenses 143.
rapurahuensis 143, pl. 275.
raritanensis 31.
ratonensis 31.
Reevesii 45, pl. 22.
× Rehderi 16, 197, 199.
Rekonis 60, pl. 57.
repanda 83, (103), pl. 121, 122.
resinosa 64, pl. 68.
reticulata (73) 75, 136, pl. 98, 99.
—— crassifolia (78).
—— Dugesi 75.
—— Greggii (78).
—— laxa (70).
—— longa 75.
—— segoviensis (58).
—— squarrosa 75, 77.
Reticulatae 72.
retracta (31).
retusa (114).
revoluta 78, pl. 111, 112.
—— dysophyllopsis 79.
Revolutae 78.
rhamnoides 31.
rhodophlebia 74, pl. 95–97.
—— applanata 74.
—— apus 74.
—— concava 74.
—— crenata 74.
—— inclusa 74.
rhombica (157)
—— obovatifolia (157).
× Richteri 16, 158, 195.
× Robbinsii 16, 196, 197.
Robur 16, 21, 34, 42.
(*See also* pedunculata and sessiliflora.)
rockvillensis 32.
Rolfsii (115).
Rosei 11, 137, pl. 260.
roseovenulosa 182, pl. 366.
Rossii 179, pl. 362.
—— Arsenei 180.
rubra 2, 9, 11, 13, 14, 15, 17, 28. (30), 31, 32, 156, 157, 158, (194), 199, 200, 201, pl. 406.
—— ambigua (195).
—— cuneata 201, 202.
—— dissecta (158).
—— falcata 201, 202.
—— juvenilis 201, 202.
—— Houbae 201, 202.
—— leucophylla (202).
—— maxima (194).
—— montana (201).
—— nana (197).
—— obovata 201, 202.
—— pagodaefolia (202).

Quercus rubra ramosissima (158).
—— runcinata (16, 156, 195).
—— texana (195).
—— triloba 201.
× Rudkini 16, 157, 158, 199, 200.
rufescens (111).
rugosa 75, pl. 101, 102.
rugulosa 181, pl. 365.
—— subtruncata 182.
Rugulosae 181.
× runcinata 16, 156, 193, 195.
—— lata 193.
Rydbergiana 96, pl. 155.
rysophylla 144, pl. 279.
Rysophyllae 144.
Sacame 89, pl. 142.
Sadleriana 19, 111, pl. 188.
Sadlerianae 111.
Saffordi (32).
Sagraeana (113).
salicifolia 9, (28, 32), 154, pl. 301.
—— oajacana (150).
—— Seemanni (161).
—— tlapuxahuensis (165).
Salicifoliae 153.
Saltillenses 182.
saltillensis 183, pl. 368, 369.
san sabeana (102).
sapotaefolia 148, pl. 291.
× Sargentii 16, 109, 110.
Sartorii 189, pl. 381.
—— magna 189.
× Saulii 17, 103, 110.
saxicola (160).
Schenckiana 93, pl. 150.
Scherzeri 172, pl. 343.
Schneckii (4, 194).
× Schuettei 17, 107, 108, 109.
Scudderi 32.
scytophylla 125, pl. 227.
Scytophyllae 125.
sebifera 93, pl. 149.
—— comitanensis 93.
Seemanni 161, pl. 317.
Segovienses 58.
segoviensis 58, pl. 54.
Seleri 181, pl. 364.
semialata (32).
semielliptica (32).
sempervirens (113).
sericea (155).
Serra 32, (185).
serrulata 179, pl. 361.
sessiliflora 33, 125, 160, 172, 195.
severnensis 32.
Shumardii 4, 14, 15, 194, pl. 395.
—— Schneckii (194).
—— texana (195).
sideroxyla 169, pl. 339.
—— aquifolia 170.
—— ciliifera 170.
Quercus Sideroxylae 169.
sillae 102, pl. 171.
simillima 180, pl. 363.
simplex 32.
simulata 32.
Simulatae 25.
× sinuata (17, 160, 200).
sinuata (31, 32), 101, pl. 169–171.
Sipuraca 182, pl. 366.
Skinneri 26, 187, pl. 378.
Skinneriae 187.
× Smallii 17, 159, 198, 200.
sonomensis (205).
sororia 54, pl. 47.
spicata (75, 77).
spinulosa (128).
splendens 133, pl. 252.
—— pallidior (130).
Spurio-ilex 32.
Spurio-ilices 25.
Standleyi 57, pl. 53.
Stantoni 32.
Steenstrupiana 32.
stellata 2, 3, 5, 6, 9, 11, 15, 16, 17, 22, 30, 34, 103, 104, 106, 108, 109, pl. 10, 177–182.
—— anomala 105.
—— araniosa (106).
—— attenuata 104, 105.
—— Boyntonii (106).
—— cruciformis 104, 105.
—— depressa (108).
—— Drummondii (105).
—— floridana (105).
—— heterophylla 105.
—— Houbae 104, 105.
—— laevis 104, 105.
—— Margaretta (106).
—— mollissima 104.
—— oblonga 104, 105.
—— Palmeri 104, 105.
—— paludosa, 104, 105.
—— parviloba 104, 105.
—— quadrata 104, 105.
—— reducta 104, 105.
—— rufescens 104, 105.
—— Sterretti 104, 105.
—— tonsa 104, 105.
Stellatae 103.
stenobalanus (52).
× sterilis (13, 17, 160, 200).
× Sterretti 17, 105, 106, 107.
stipularis 130, pl. 242–244.
straminea 32.
striatula 5, 93, pl. 151, 152
—— otinapensis 94.
Striatulae 93.
strombocarpa 42, pl. 16, 17.
subavenia 169, pl. 338.
subcrispata 176, pl. 353.
Suber 4, 19.
suberoides (112).
× subfalcata 17. 158, 202.
Quercus subimbricaria (16).
× subintegra 17, 156, 202.
× sublaurifolia (13, 17, 156, 157).
submollis 98, pl. 163.
subsinuata 32.
subspathulata 56, pl. 52.
× substellata 17, 104, 105, 109.
substenocarpa 52, pl. 41.
subtriloba 81, pl. 118.
subturbinella 95, pl. 153.
succulenta (115).
× Sudworthi (17, 199, 202).
Sullyi 32.
sumterensis 32.
suspecta 32.
Suspectae 25.
synthetica 151, pl. 296, 297.
—— crenifolia 151.
Syntheticae 150.
tahuasalana 9, 154, pl. 302.
tepicana 135, pl. 255.
tepoxuchilensis 180, pl. 363.
—— perplexans 180.
texana 15, (194), 195, pl. 396.
—— chesosensis 195.
—— stellapila 195.
texcocana 81, pl. 117.
—— ampla 81.
tinctoria (32, 198).
—— angulosa (198).
—— californica (205).
—— macrophylla (198).
—— magnifica (198).
—— nobilis (198).
—— pseudoxalapensis (198).
—— sinuosa (198).
—— Willdenowiana (202).
tlapuxahuensis 165, pl. 325.
—— obconica 165.
tolimensis 12, 142, pl. 270, 271.
tomentella 118, pl. 211, 212.
—— conjungens 119.
tomentosa (69).
—— abbreviata (67).
—— bullata (68).
—— communis (69).
—— diversifolia (79).
tonaguiae 190, pl. 385.
Tonduzii 146, pl. 285.
Totutlenses 151.
totutlensis 151, pl. 297.
Toumeyi 5, 95, pl. 153.
toxicodendrifolia 48, pl. 33.
transgressa 32.
transmontana 71, pl. 89.
—— lata 72.
triangularis (32).
tridens 171, pl. 340.
× tridentata 17, 156, 198, 200.
Tridentes 170.
triloba (201).
trinitatis 144, pl. 277.
Tristes 171.

Quercus tristis 171, (177), pl. 341–343.
—— mixcoensis 172.
—— Niederleini 171.
—— sublobata 171.
—— vulcani 172.
tuberculata 56, pl. 51.
Tuberculatae 56.
turbinata (153).
turbinella (117).
Turneri (31, 32).
Uhdeana 75, pl. 100.
uliginosa (159).
—— laurifolia (156).
umbrosa (203).
undata 86, pl. 135.
undulata 13, 34, 96, (98), pl. 155–157.
—— Gambelii (99).
—— Jamesii (96).
—— obtusifolia (98).
—— pedunculata (97).
—— pungens 96.
—— Rydbergiana (96).
—— Vaseyana 96.
—— Wrightii (96).
Undulatae 94.
Urbani 8, 133, pl. 253.
ursina 32, 34.
Uruapanenses 143.
uruapanensis 143, pl. 276, 277.
utahensis 98, pl. 158.
—— submollis (98).
vaccinifolia 120, pl. 210.
valdensis 32.
vallicola 81, pl. 116.
vancouveriana 30, 32.
varians (50).
Quercus Vaseyana (96).
vellifera 73, pl. 90.
velutina 2, 3, 4, 7, 9, 11, 12, 14, 15, 16, 17, 32, 34, 156, 157, 158, 195, 196, 197, 198, 200, 202, pl. 4, 398, 399.
—— acuta 197.
—— angulosa 197, 198.
—— dilaniata 197.
—— macrophylla 197, 198.
—— magnifica 197, 198.
—— missouriensis 197, 198.
—— nobilis 197, 198.
—— obovata 197, 198.
—— pagodaeformis 197.
—— sinuosa 197, 198.
Velutinae 197.
venustula 97, pl. 158.
verrucosa (155).
versicolor (109).
vexans 190, pl. 386.
viburnifolia 25, 27, 32.
victoriae 32.
villosa (105).
viminea 123, pl. 222.
Vimineae 122.
Vicentenses 58.
vicentensis 59.
virens (32, 113).
—— dentata (115).
—— maritima (115).
Virentes 112.
virginiana 4, 5, 9, 14, 26, 32, 107, 113, 154, pl. 189, 190.
—— dentata (115).
—— eximea (115).
—— fusiformis (114).
—— geminata (115).
Quercus virginiana grandifolia (115).
—— macrophylla 112, 113.
—— maritima (115).
—— minima (115).
—— pygmaea (115).
—— Sagraeana 112, 113.
—— virescens 112, 113.
voyana (32).
Vreelandii 99, pl. 166.
× Walteriana 17, 101, 160, 194, 198, 199, 200.
Wardiana 32.
Warscewiczii (43).
washingtonensis 28, 32.
Weedii 32.
Wesmaeli 172, pl. 345.
Whitei 32.
Wilcoxii 119, pl. 215.
Wilkinsoni 33.
× Willdenowiana 17, 194, 199, 202.
Wislizeni 205, pl. 419.
—— extima 205.
—— frutescens 205.
—— parvula 205.
wyomingiana 32.
xalapensis 192, pl. 392, 393.
—— jalapae 193.
—— longifolia (163).
—— surculina 193.
xilina (60, 70).
xylina (60, 70, 77).
Yanceyi 32.
zempoaltepecana 164, pl. 323.
Zempoaltepecanae 164.
Zorastri 26.
Scolodrys (106).
Sophora 30.

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QUERCUS PALUSTRIS.

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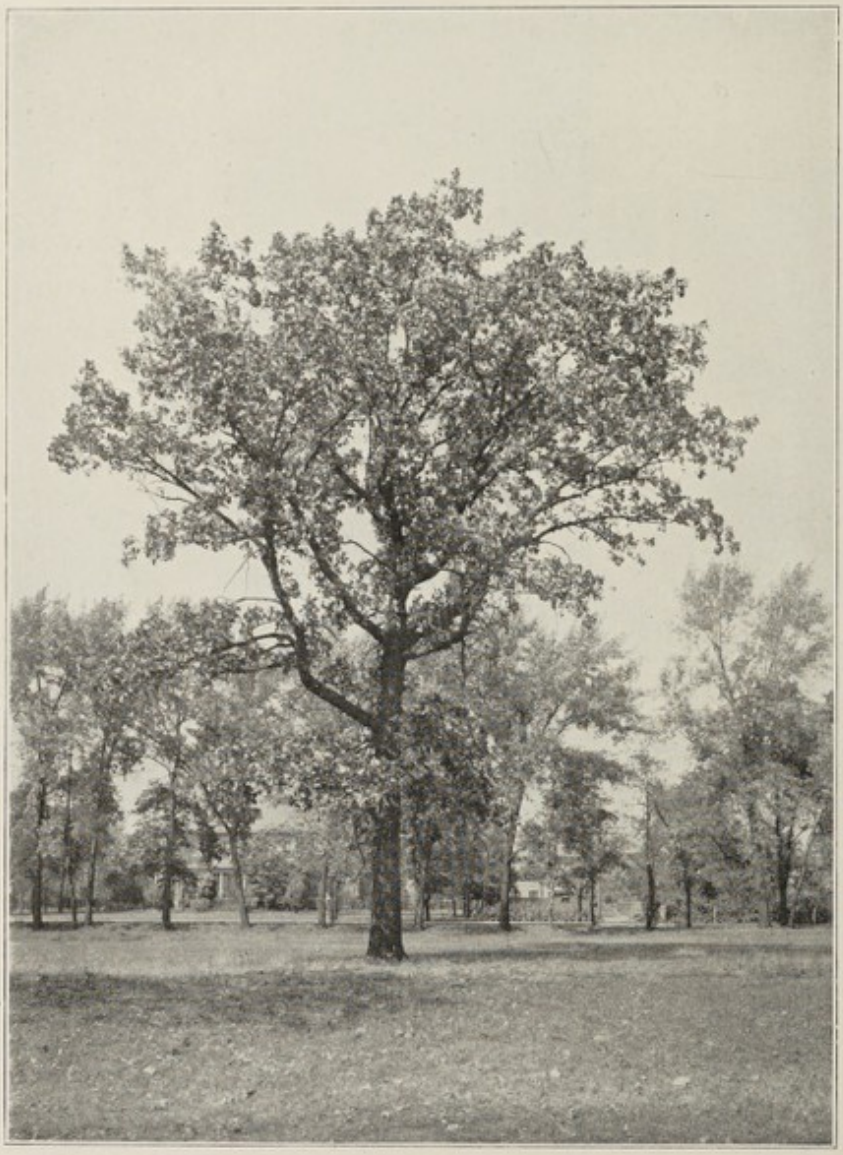

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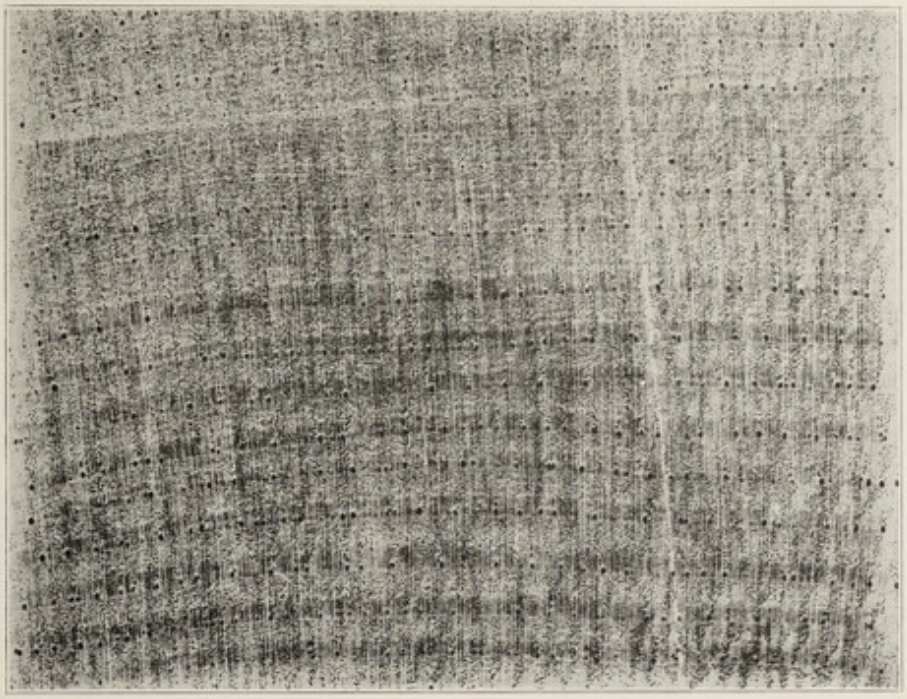
QUERCUS PILICAULIS HURTERI.





BARK OF LEUCOBALANUS AND ERYTHROBALANUS.



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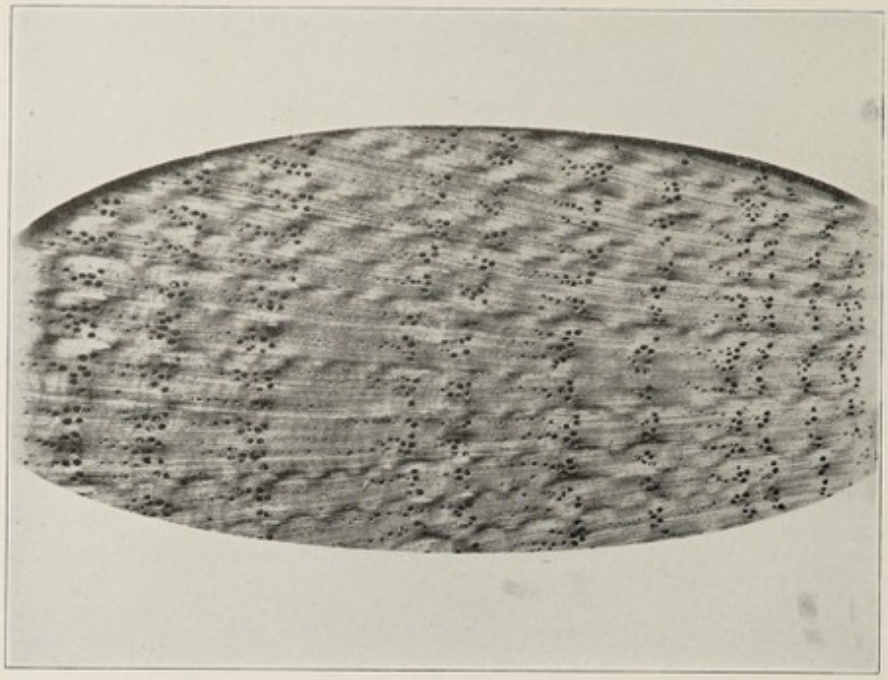

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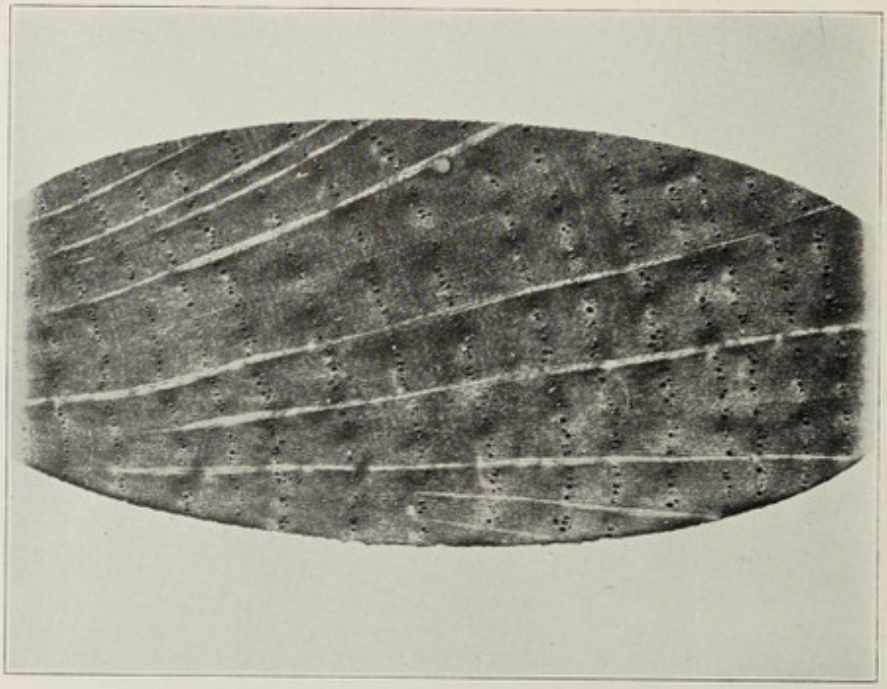

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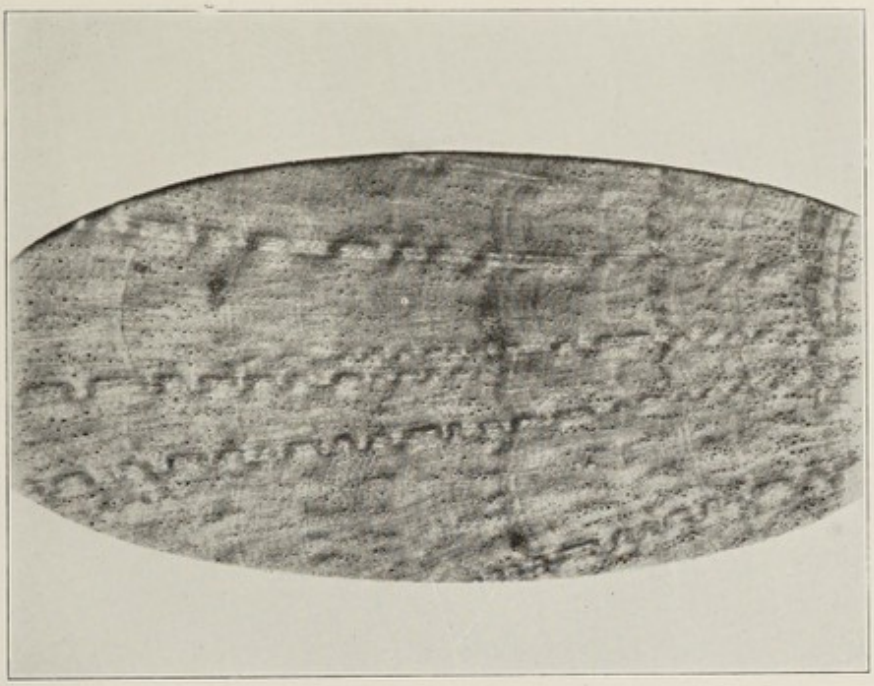

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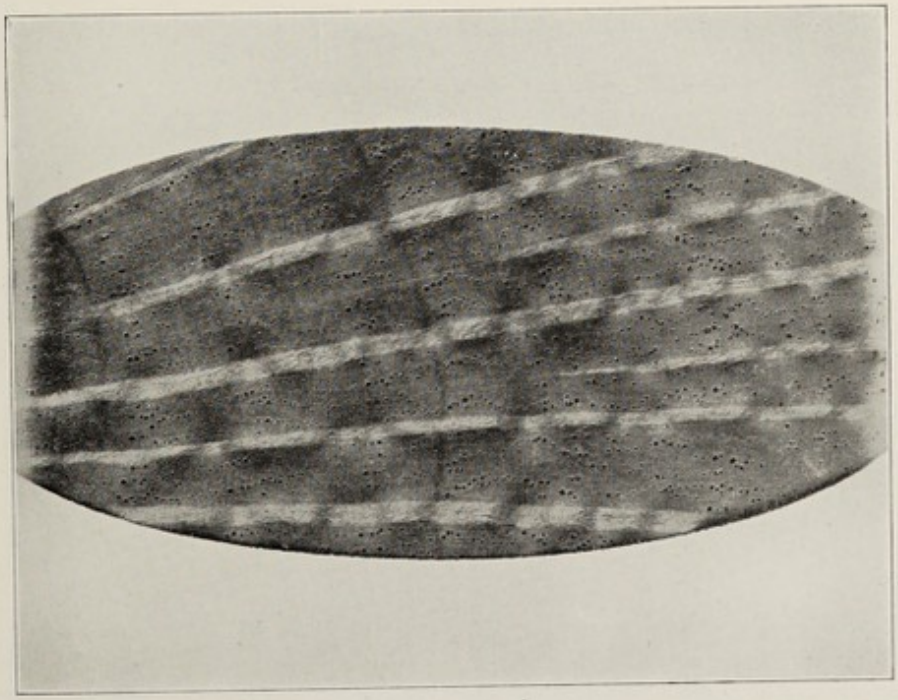

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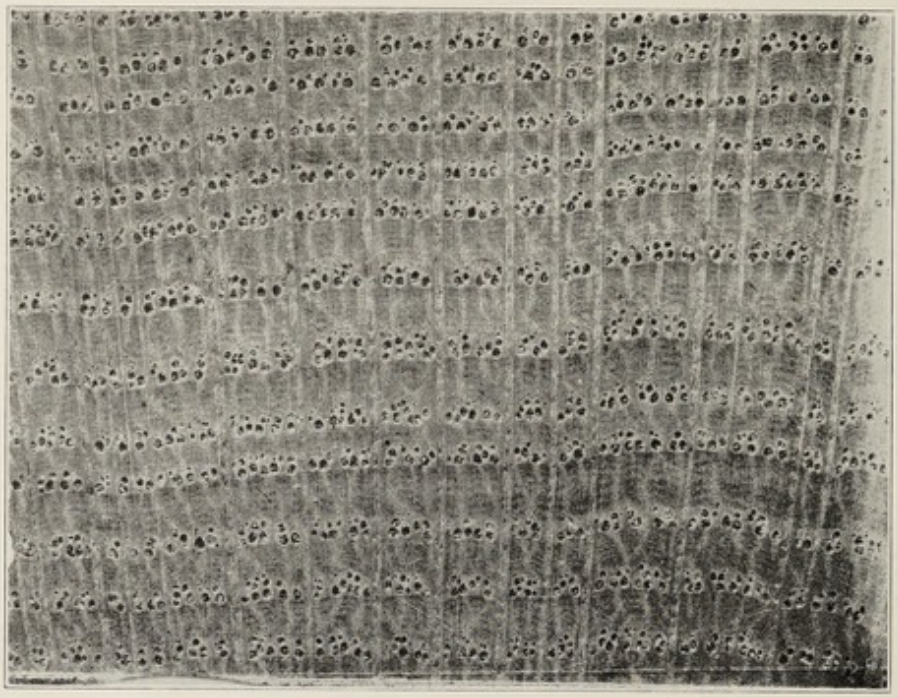
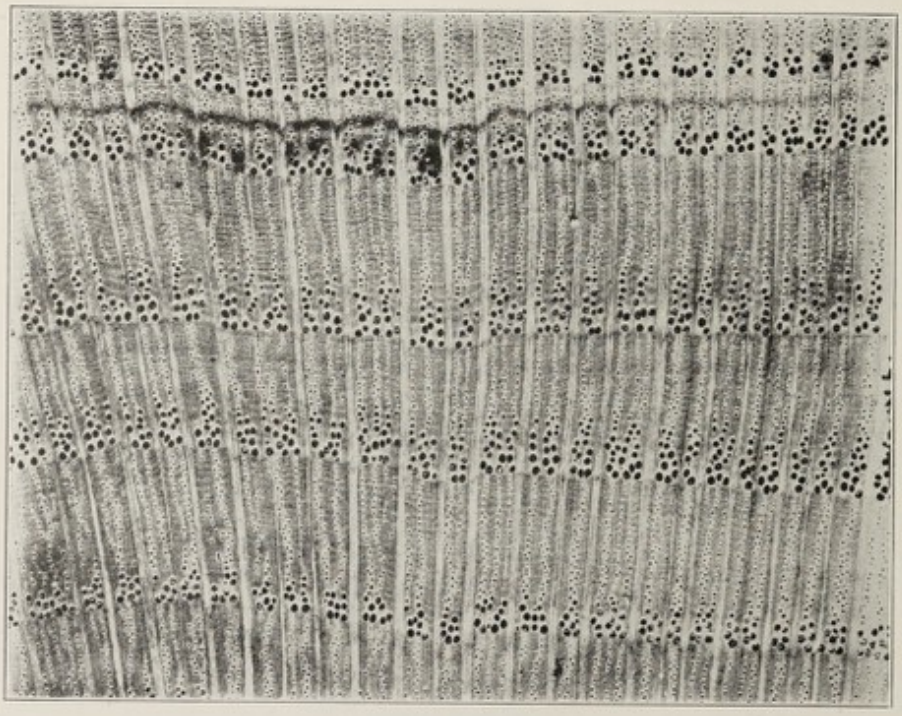


QUERCUS ALBA.



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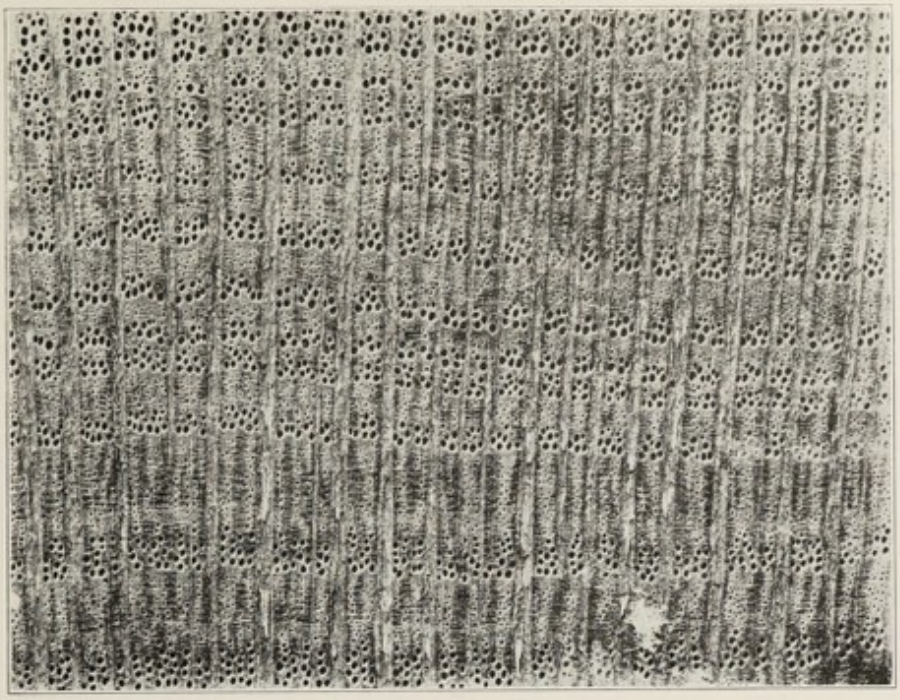

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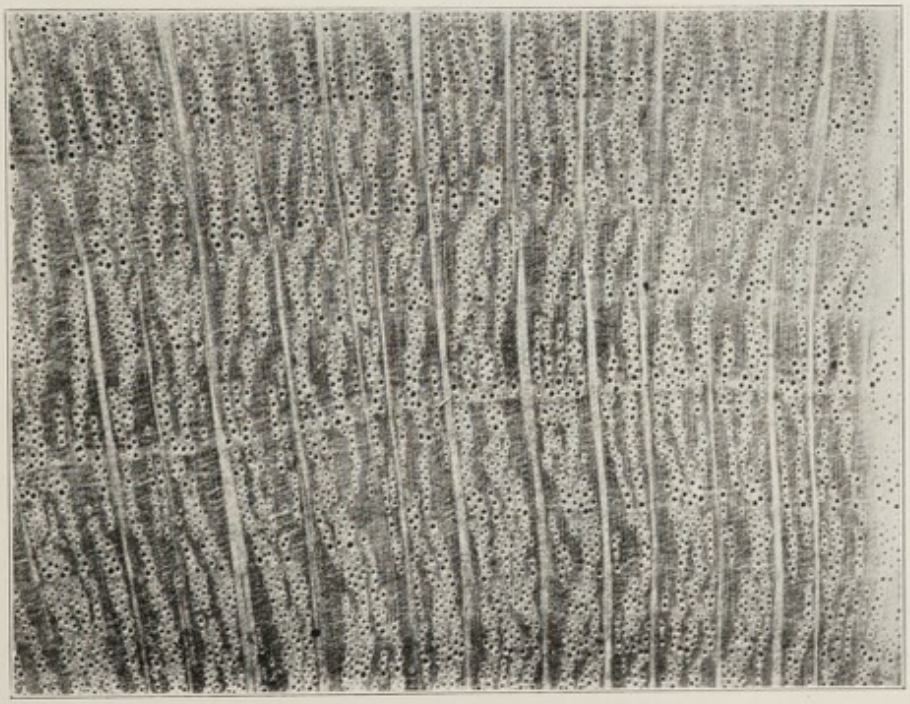
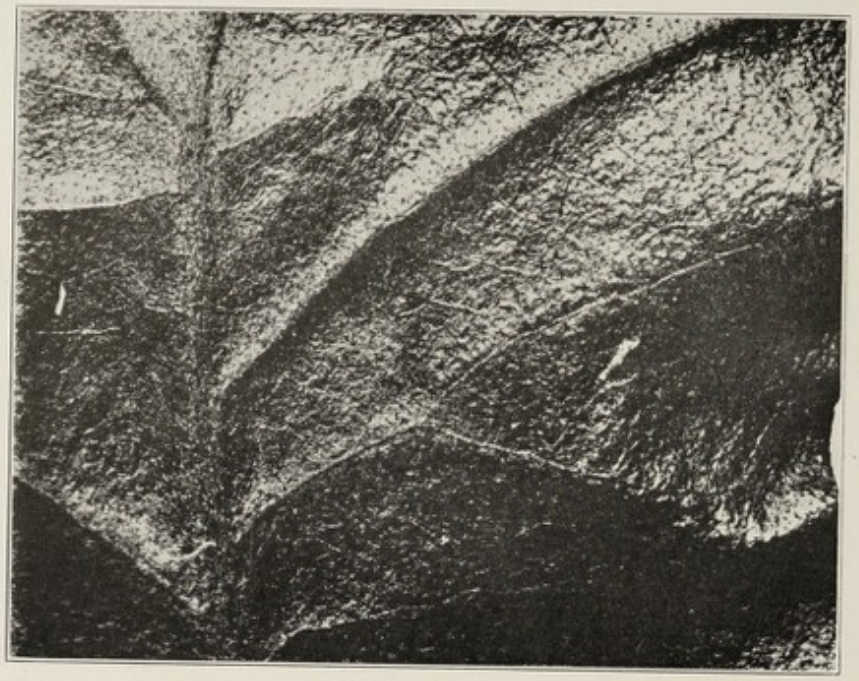


QUERCUS CHRYSOLEPIS.



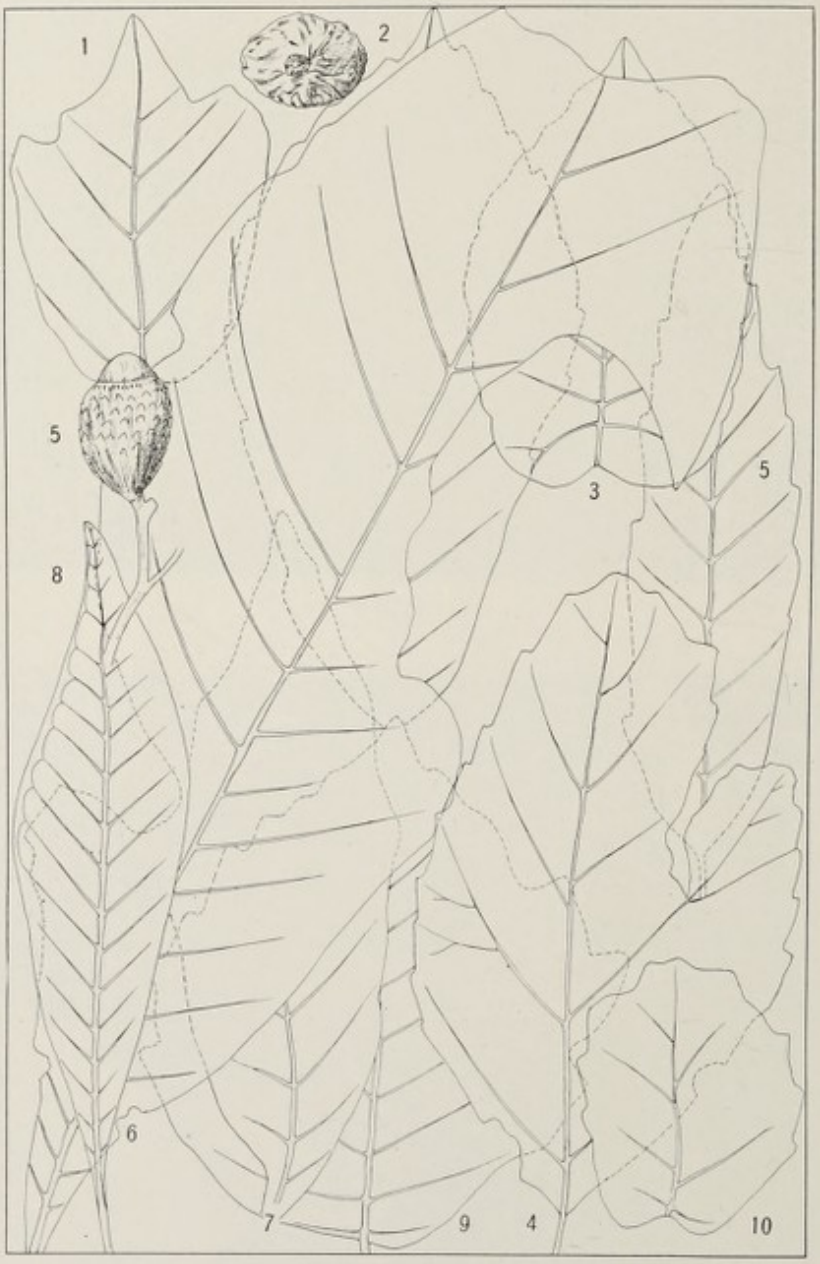
QUERCUS STELLATA.



QUERCUS PALUSTRIS.



CRETACEOUS AMERICAN OAKS.



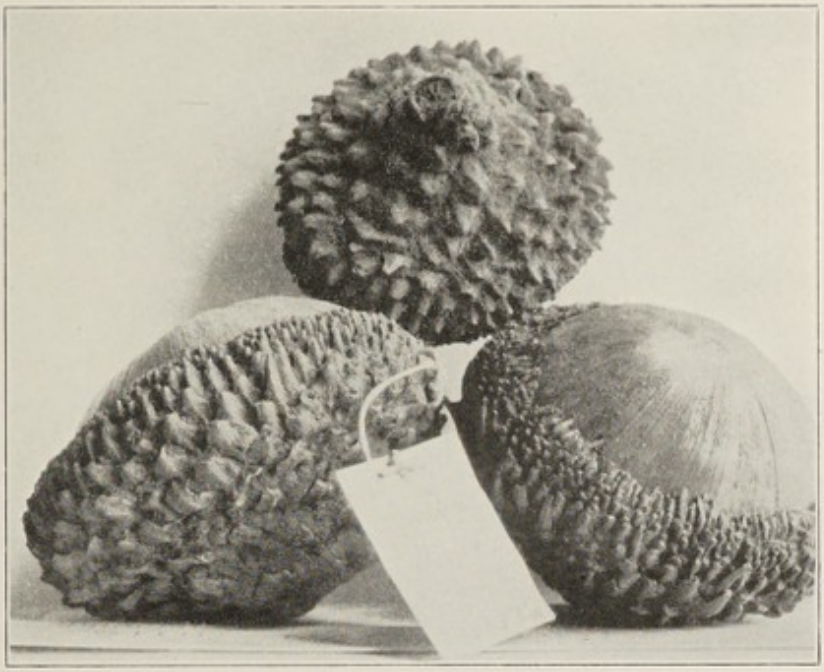
EOCENE AMERICAN OAKS.

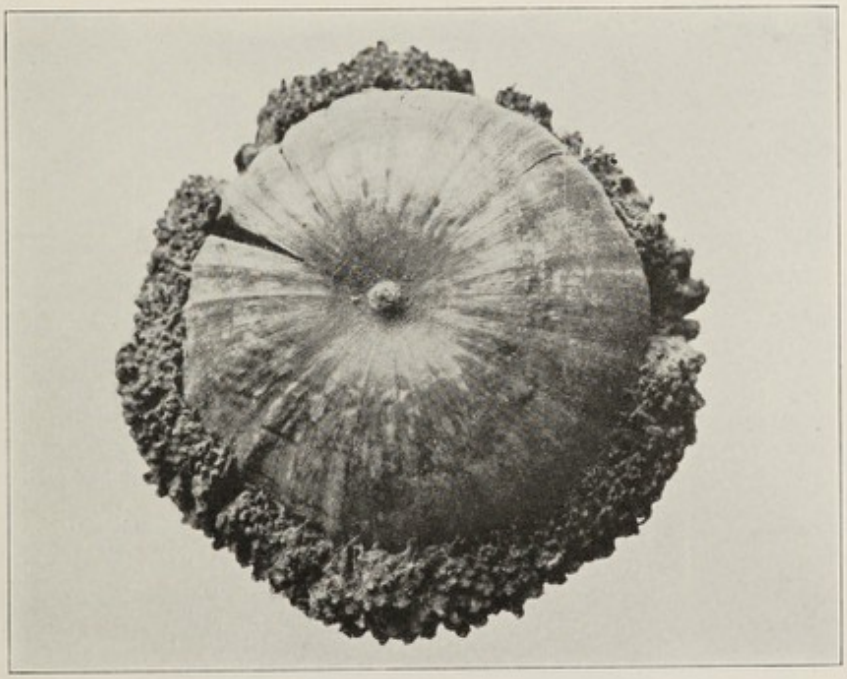


MIOCENE AMERICAN OAKS.



QUERCUS INSIGNIS.





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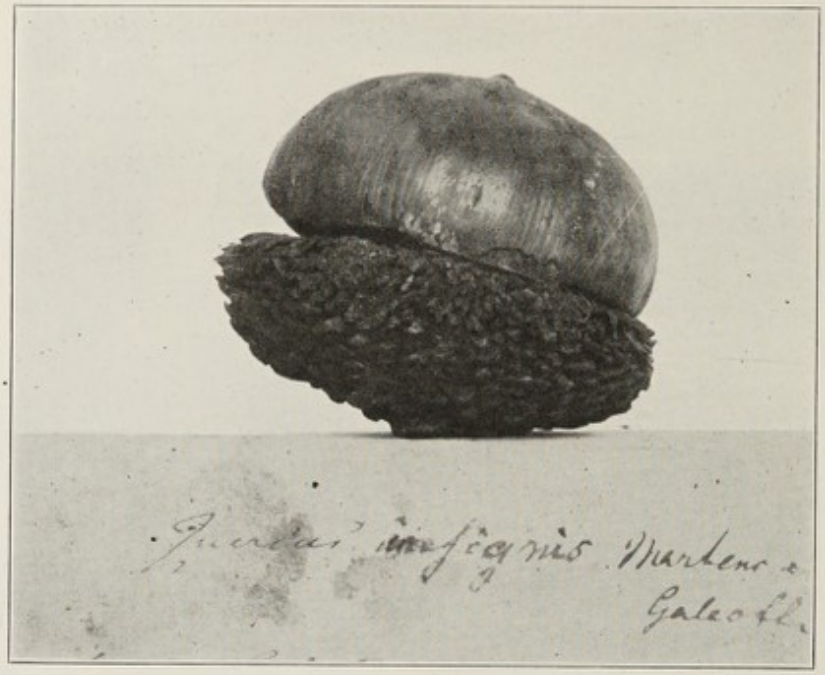

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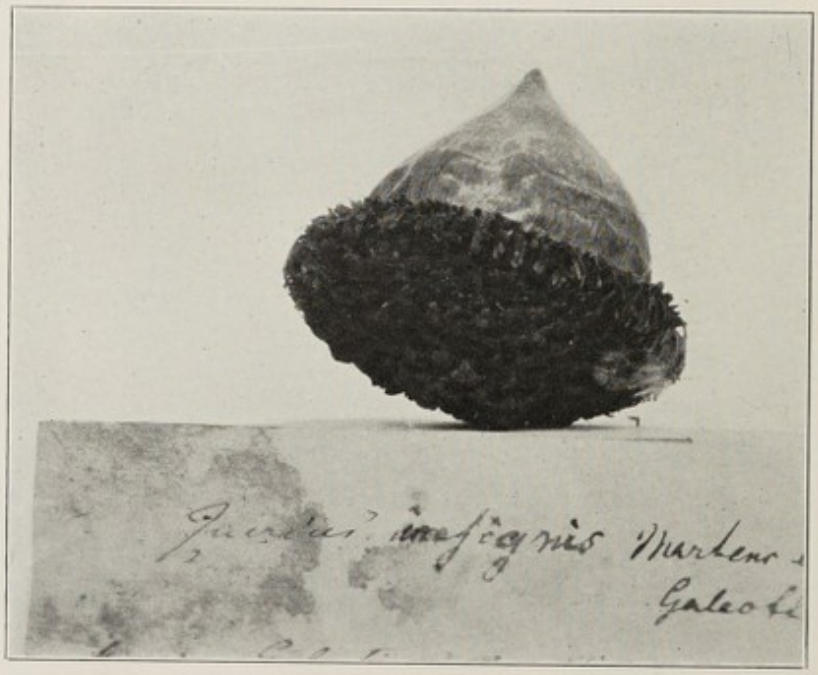
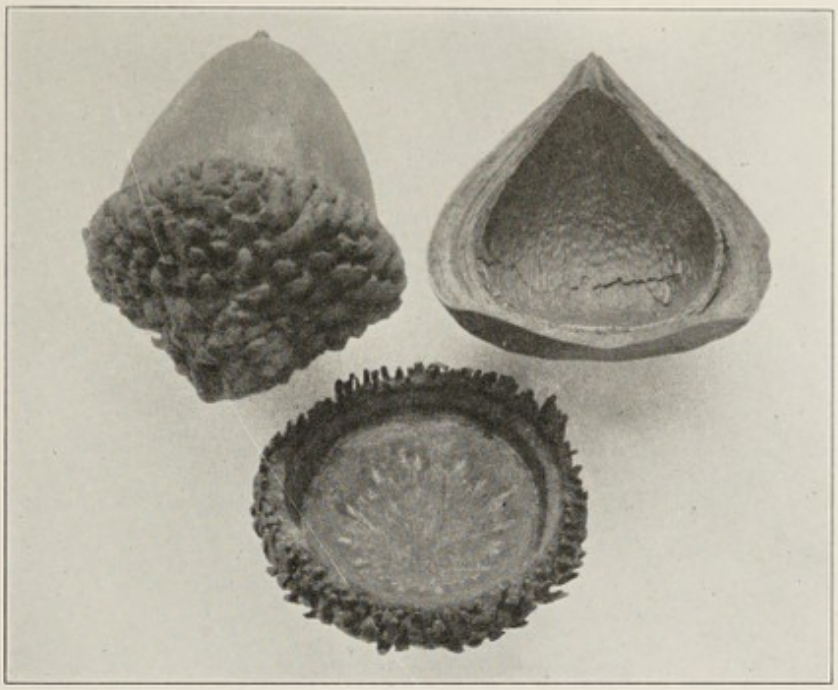


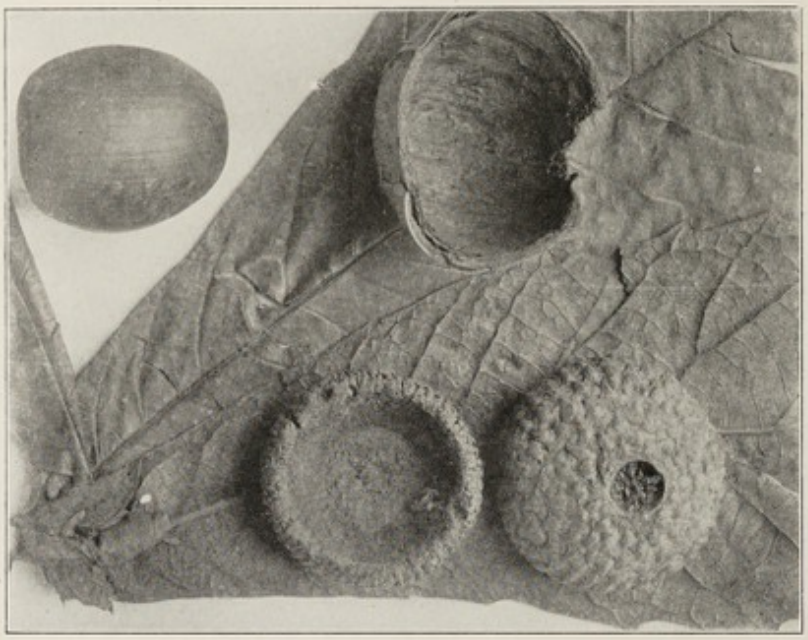
QUERCUS STROMBOCARPA.





QUERCUS STROMBOCARPA.

27837—24——2





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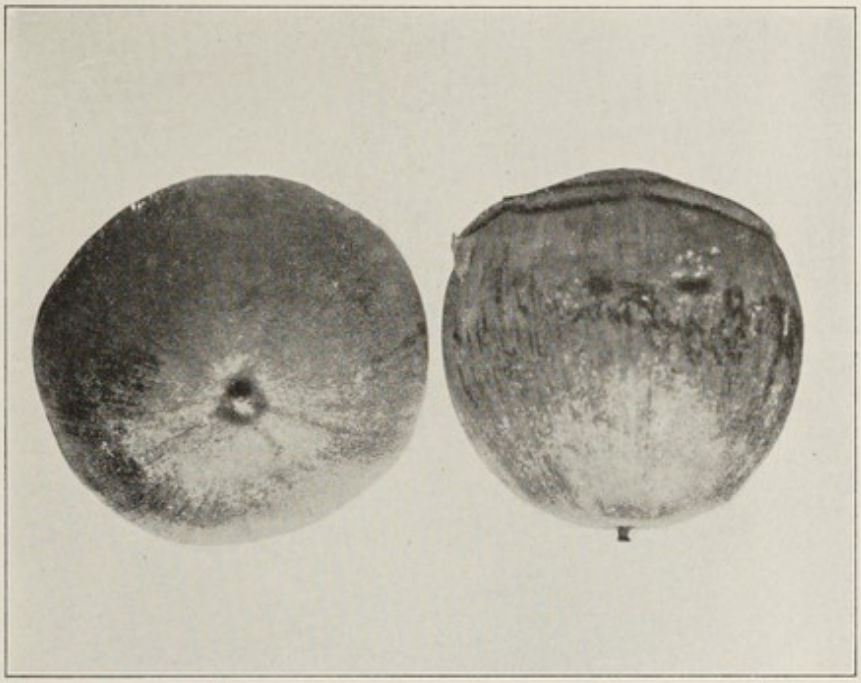
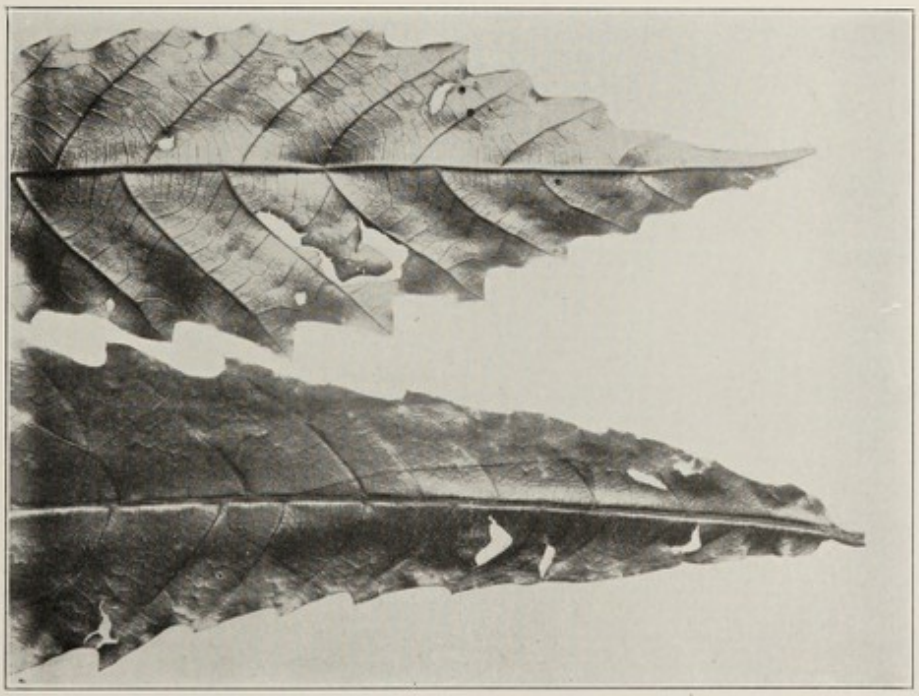
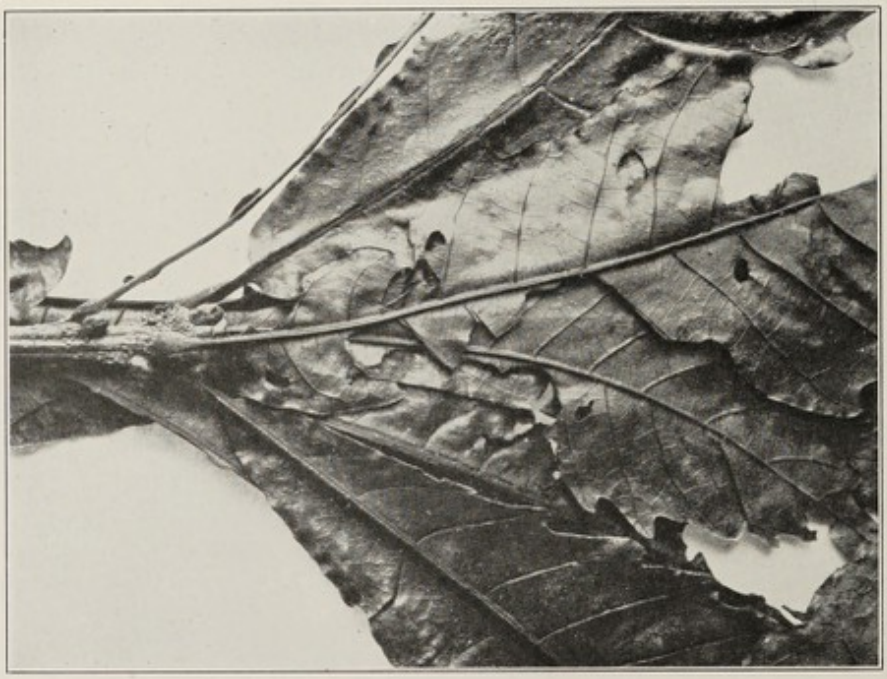


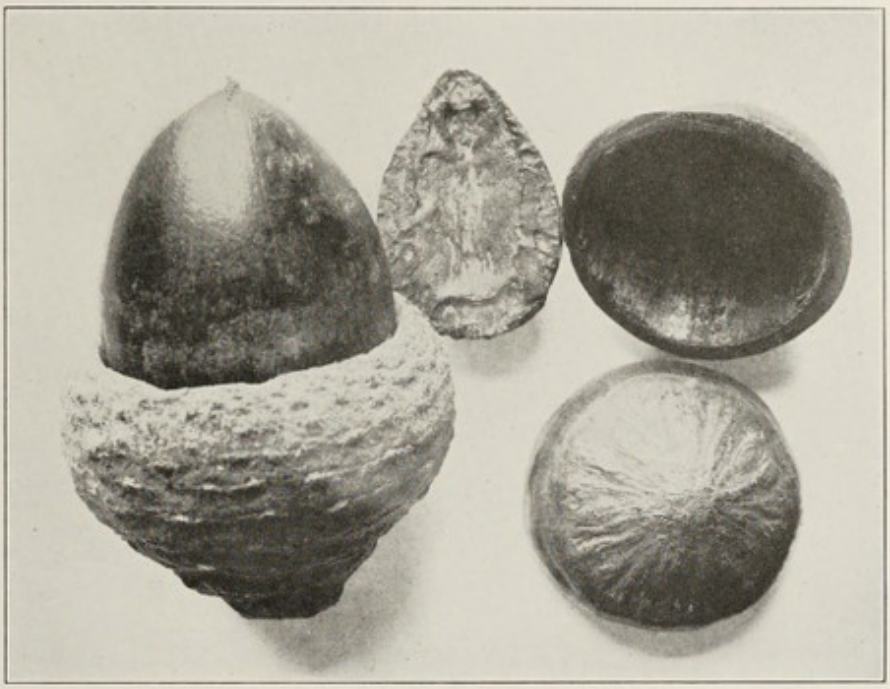


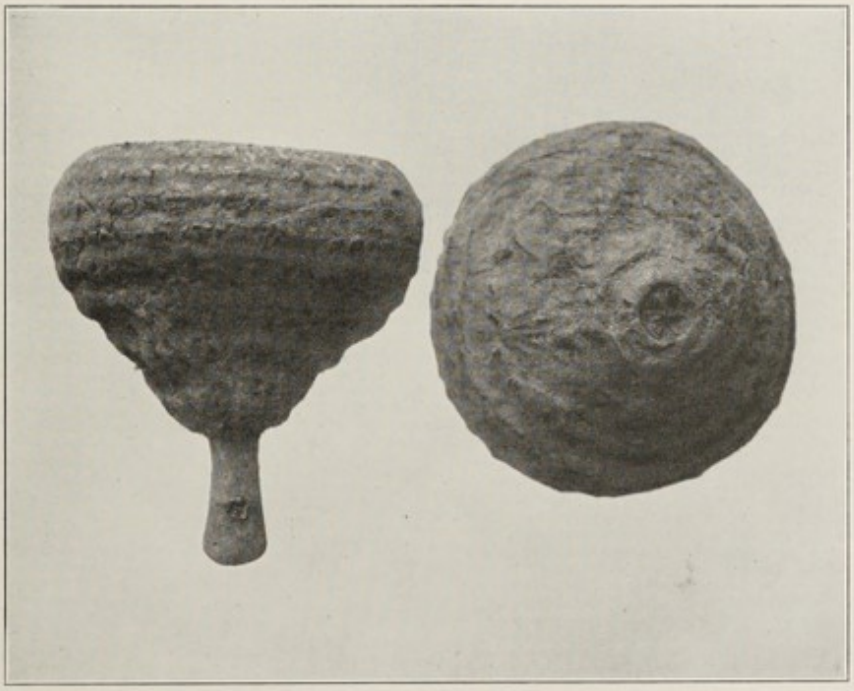
QUERCUS PILARIUS.





QUERCUS CYCLOBALANOIDES.





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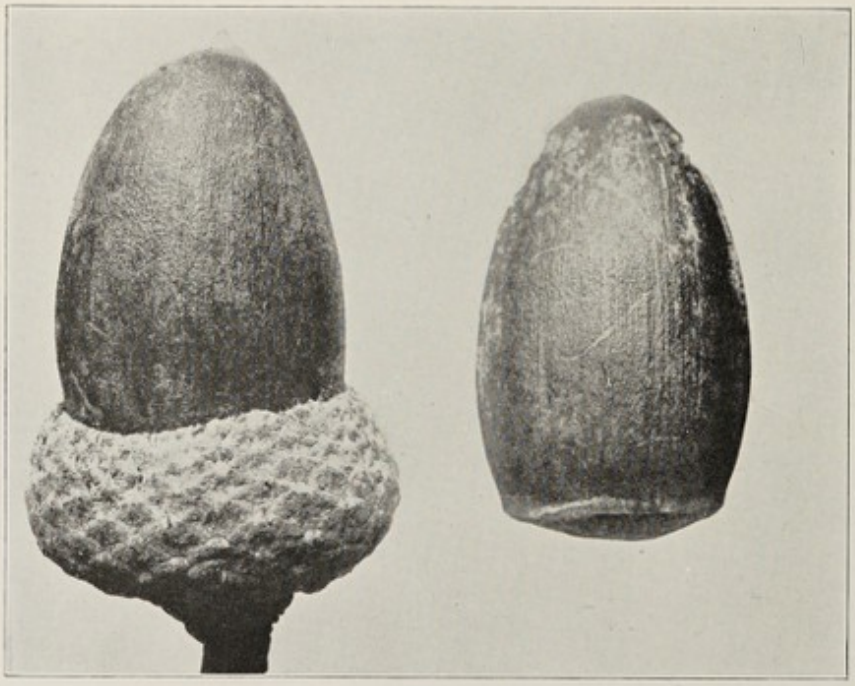
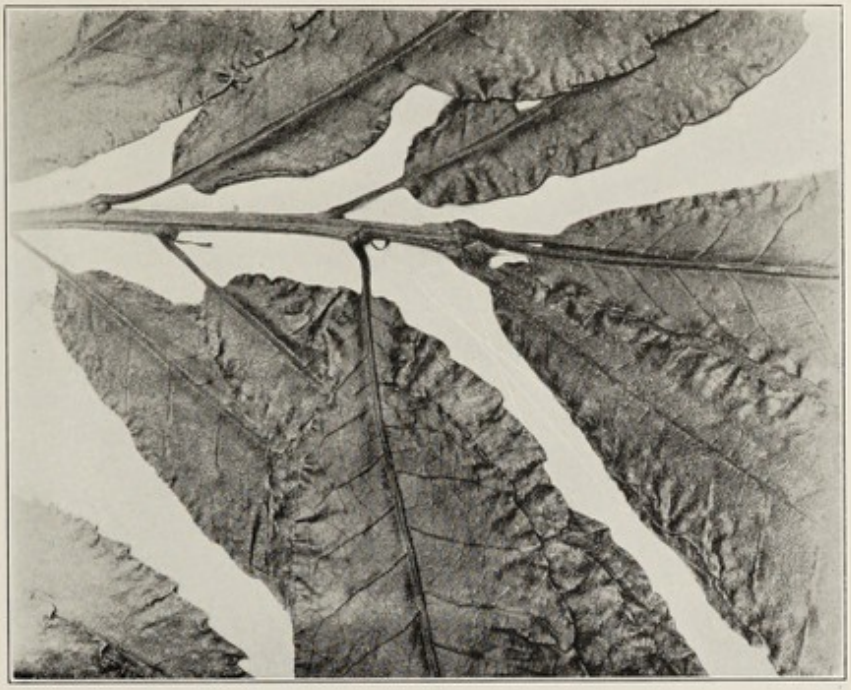


QUERCUS REEVESII.





QUERCUS CORRUGATA.



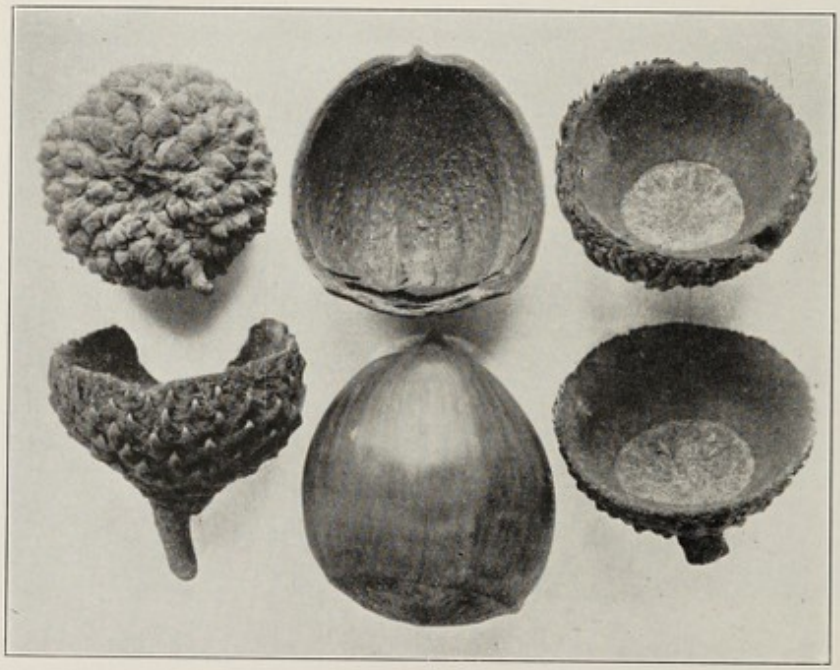


QUERCUS CORRUGATA GRANULIFERA.



QUERCUS GALEOTTII.





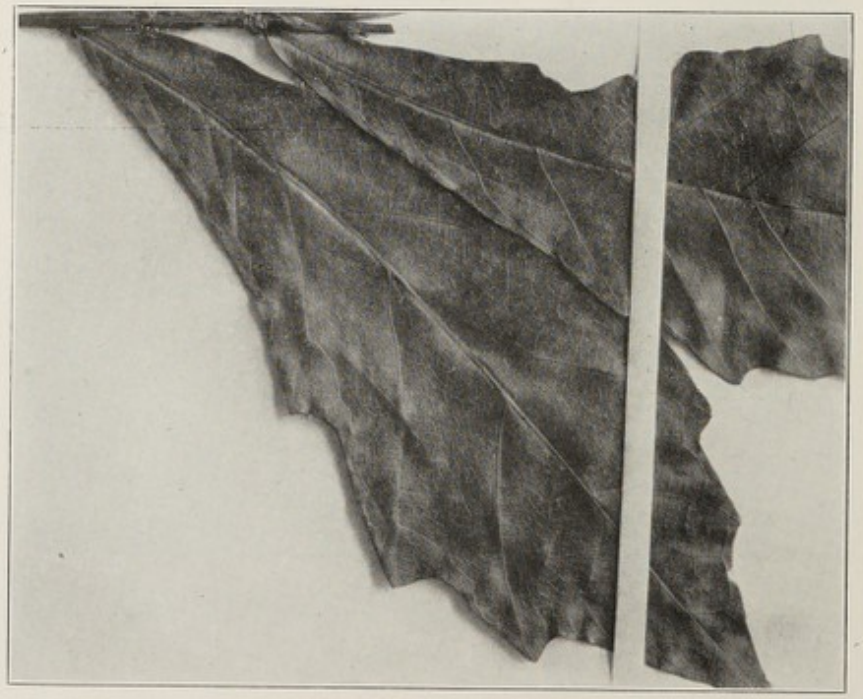
QUERCUS GALEOTTII.



QUERCUS PILGERIANA.



QUERCUS PINALENSIS.



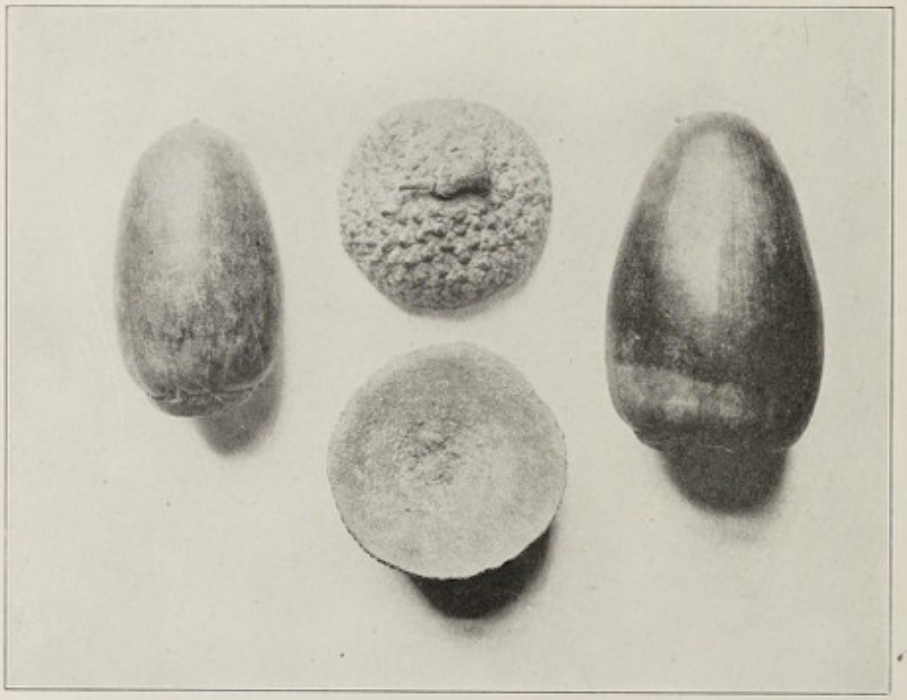
QUERCUS CHINANTLENSIS.





QUERCUS EXCELSA.





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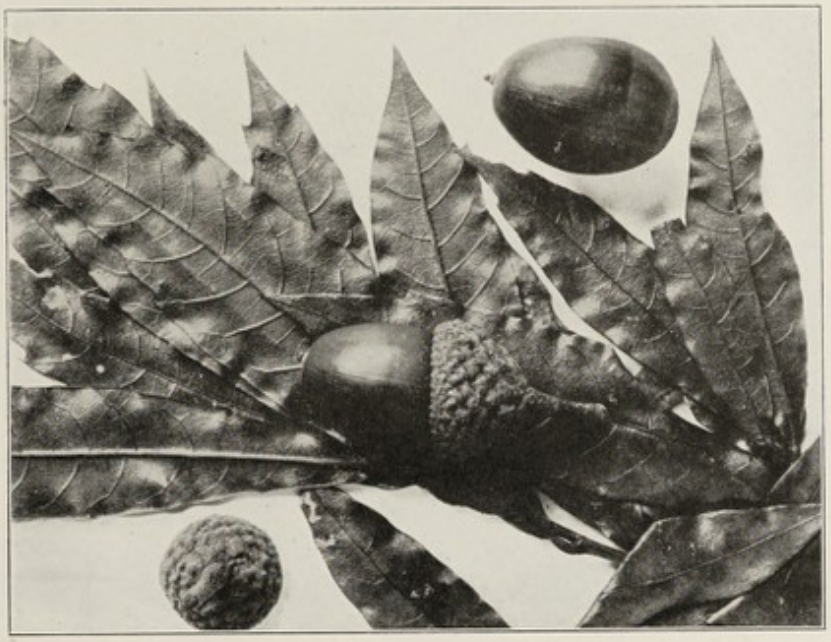




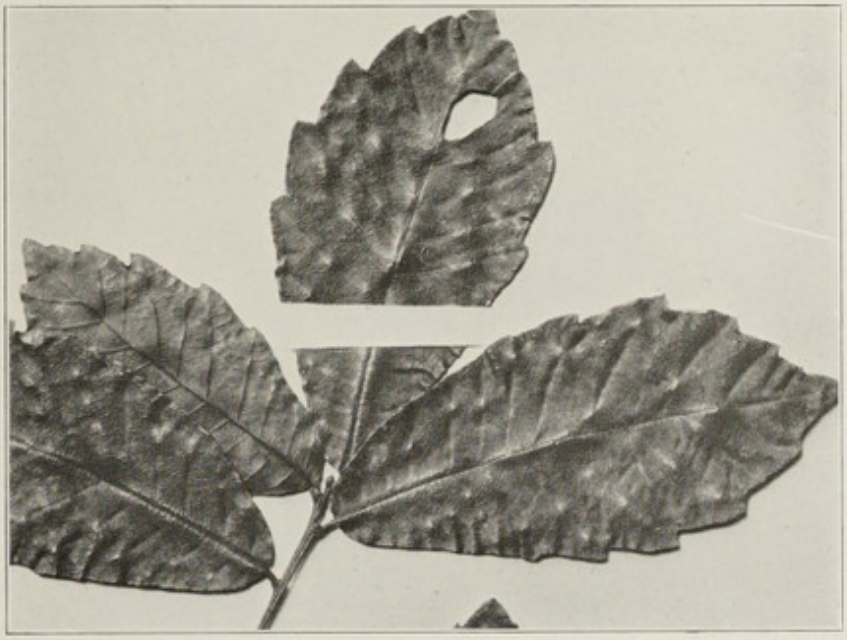
QUERCUS LEIOPHYLLA.



QUERCUS LANCIFÓLIA.



QUERCUS LANCIFOLIA PILOSIUSCULA.



QUERCUS TOXICODENDRIFOLIA.



QUERCUS BOQUERONAE.

27837—24——3



QUERCUS GLABRESCENS.



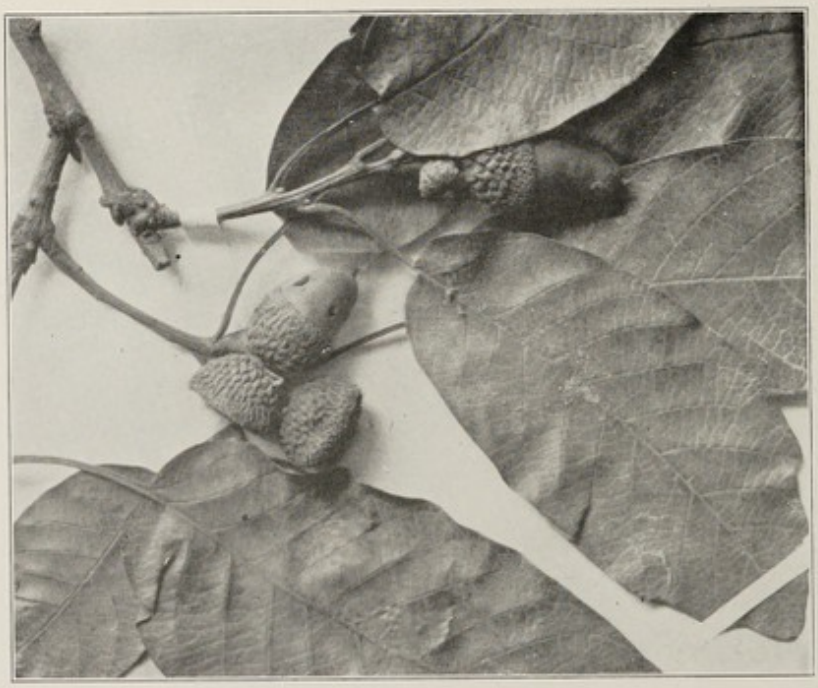
QUERCUS GLABRESCENS INTEGRIFOLIA.





QUERCUS RADLKOFERIANA.

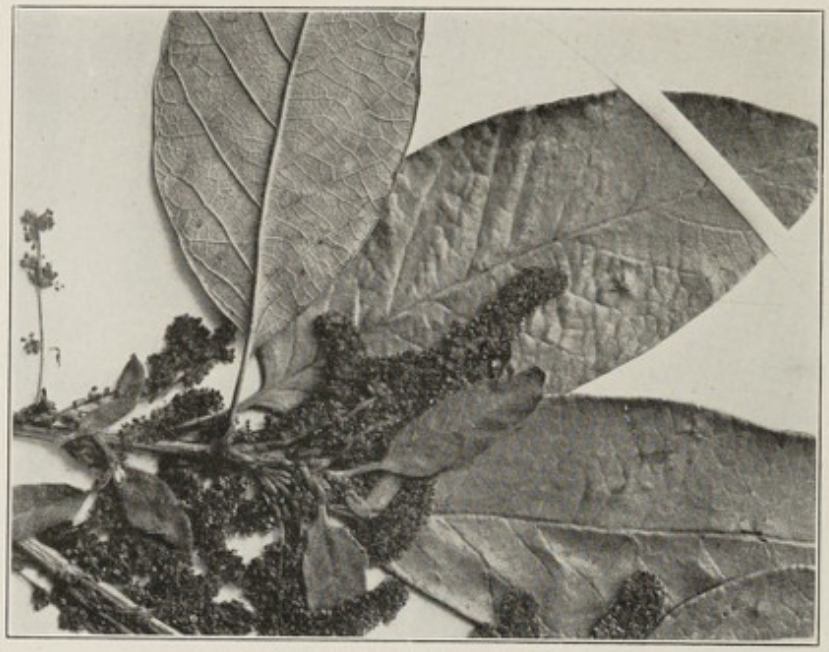




QUERCUS POLYMORPHA.



QUERCUS POLYMORPHA.



QUERCUS POLYMORPHA.



QUERCUS JUERGENSENII.



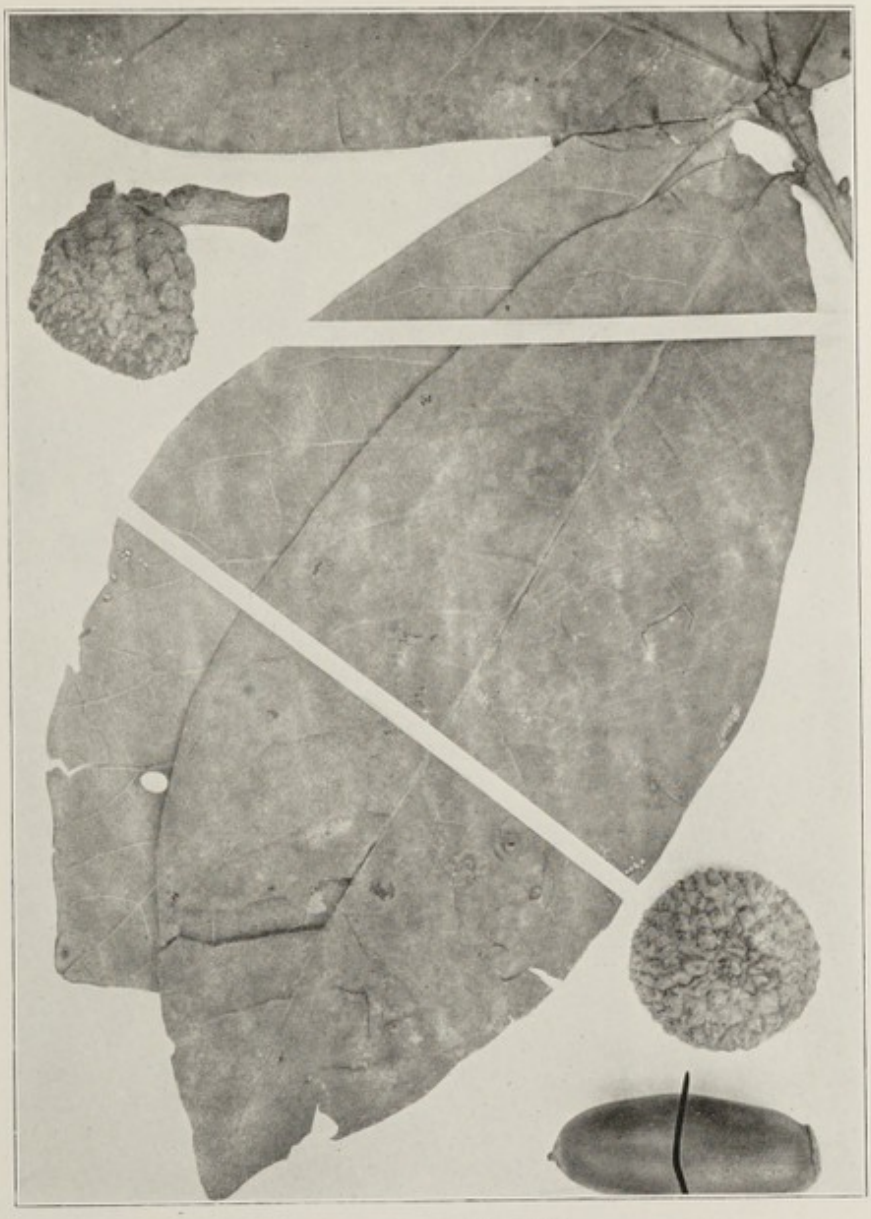


QUERCUS PORPHYROGENITA.





QUERCUS GERMANA.



QUERCUS SUBSTENOCARPA.



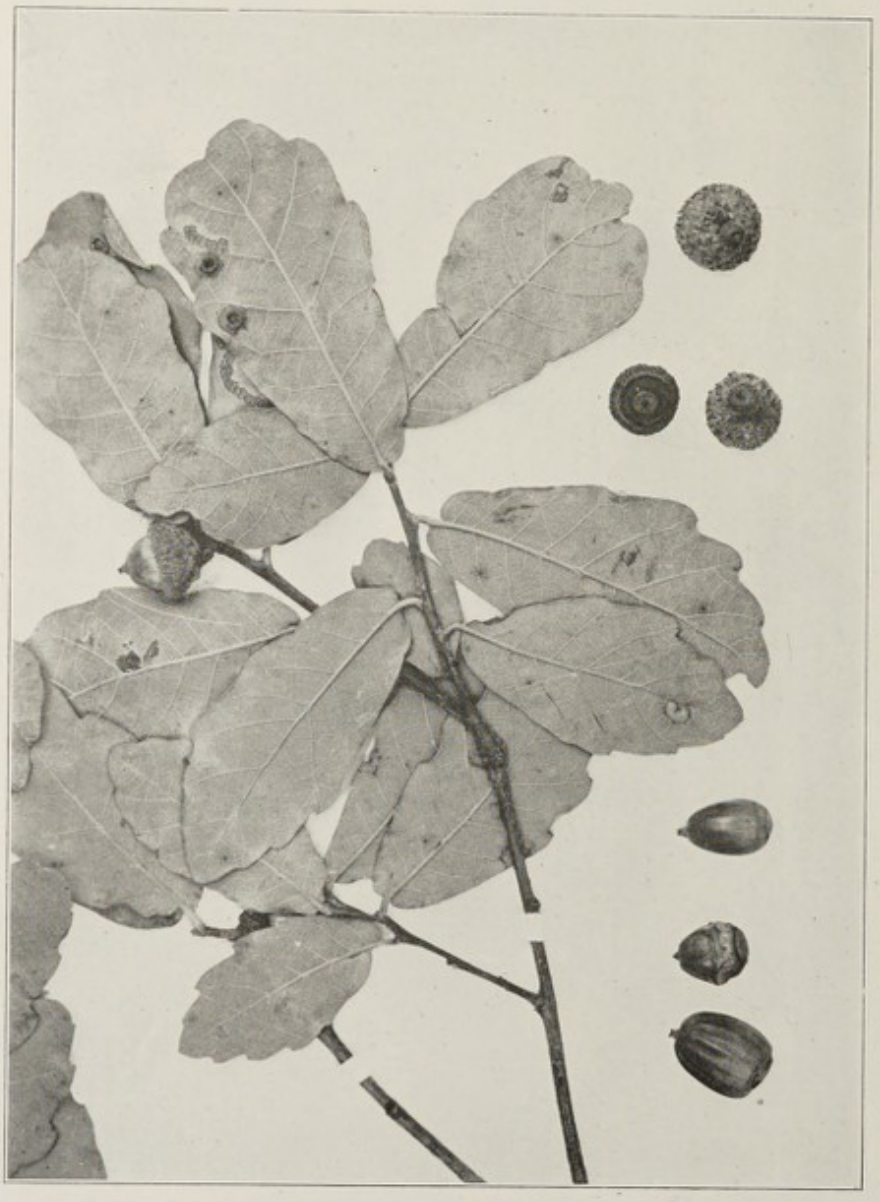
QUERCUS GLAUCOIDES.



QUERCUS GLAUCOIDES.



QUERCUS BALDOQUINAE.



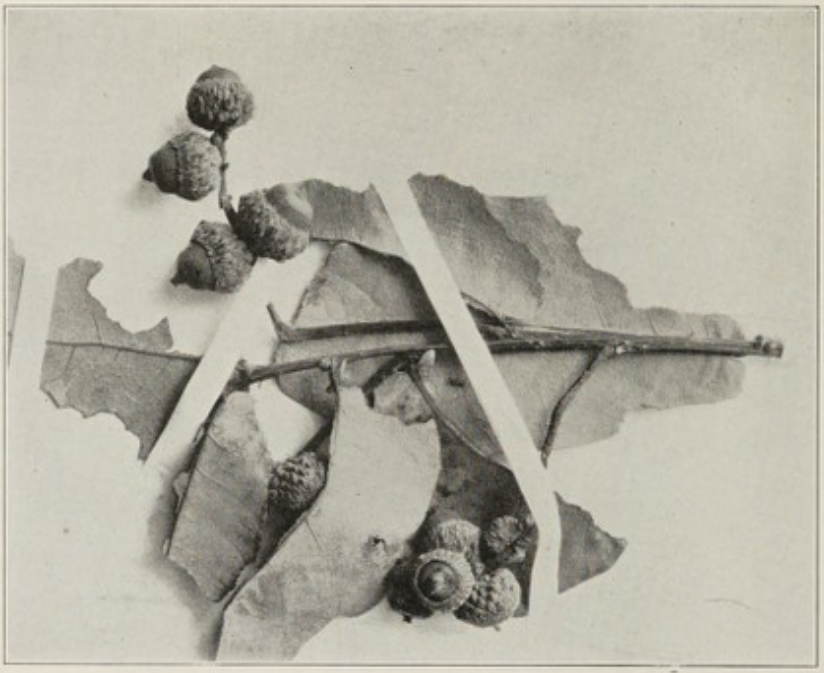
QUERCUS GLAUCOPHYLLA.



QUERCUS GLAUCOPHYLLA TLACOLULANA.



QUERCUS HARMSIANA.





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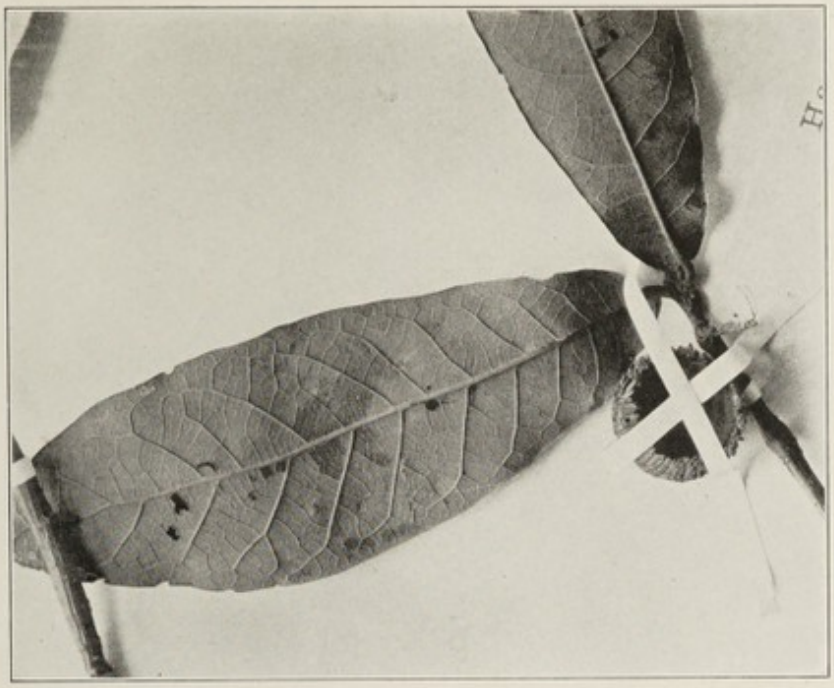



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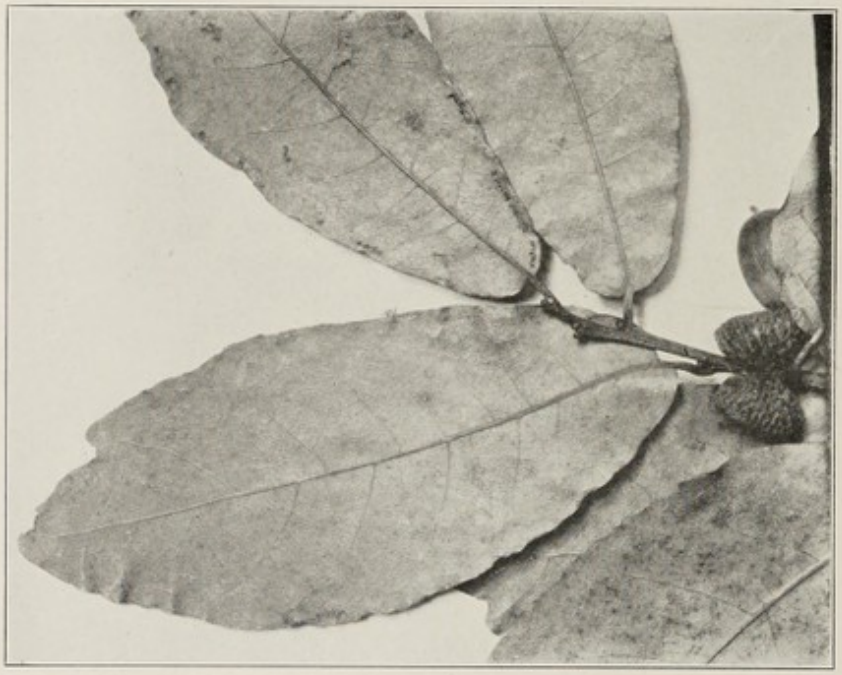
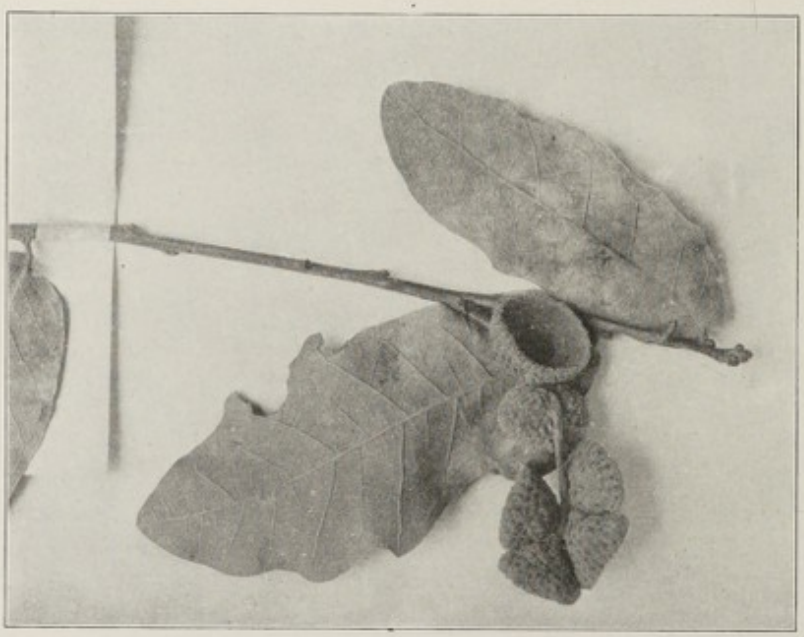
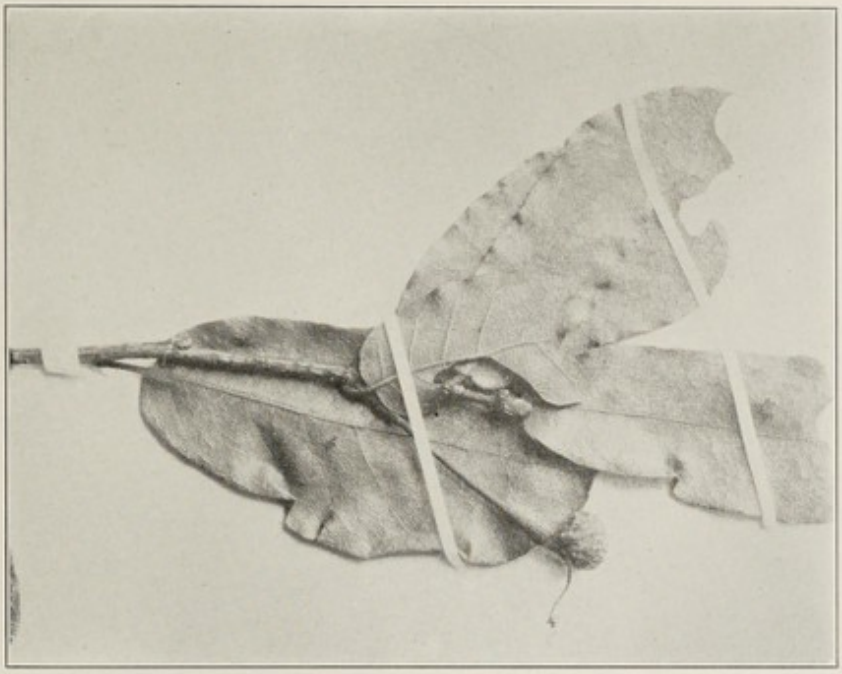




QUERCUS CONJUNGENS.





QUERCUS CANCELLATA.

27837—24——4





QUERCUS GLAUCESCENS.



QUERCUS TUBERCULATA.



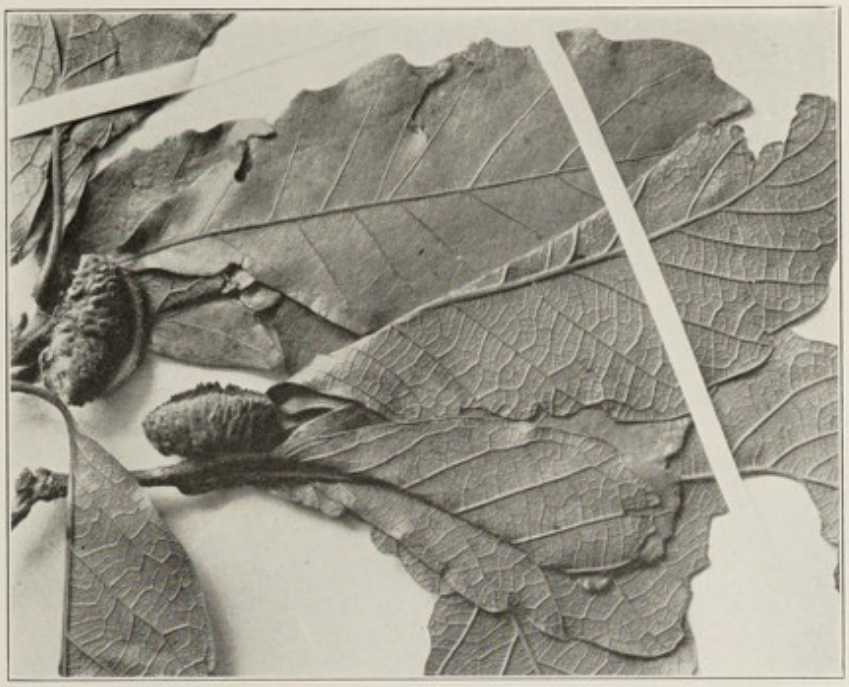
QUERCUS IDONEA.



QUERCUS SUBSPATHULATA.



QUERCUS CRENATIFOLIA.



QUERCUS AURANTIACA.



QUERCUS STANDLEYI.



QUERCUS SEGOVIENSIS.



QUERCUS MATAGALPANA.





QUERCUS ARACHNOIDEA.



QUERCUS MARTENSIANA.



QUERCUS REKONIS.

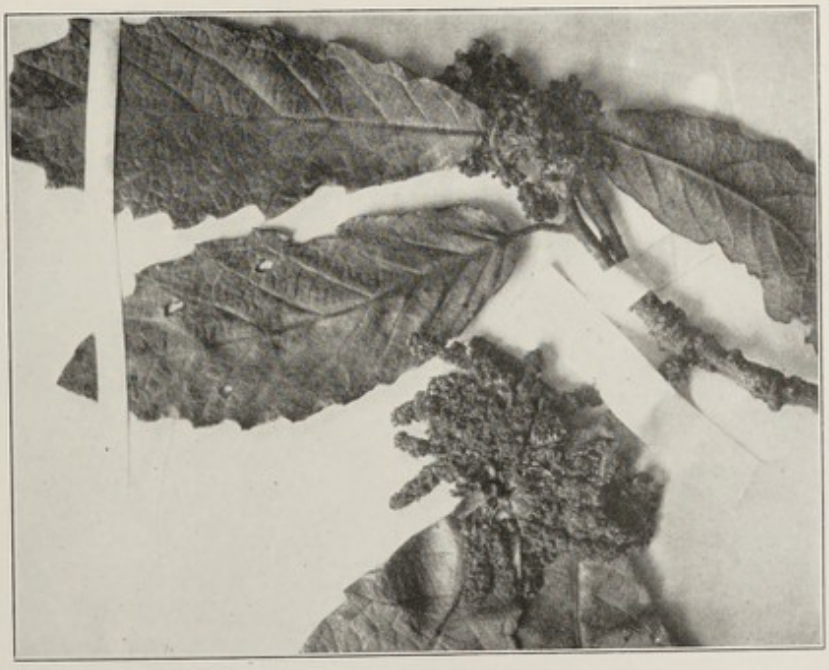


QUERCUS MARTENSIANA.



QUERCUS PRINOPSIS.





QUERCUS CHARTACEA.



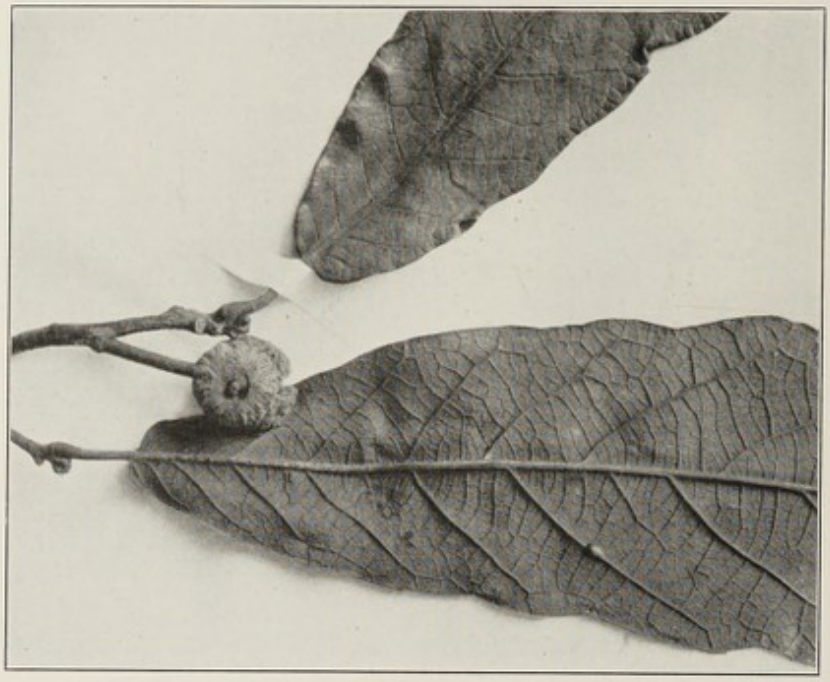


QUERCUS CENTRALIS.





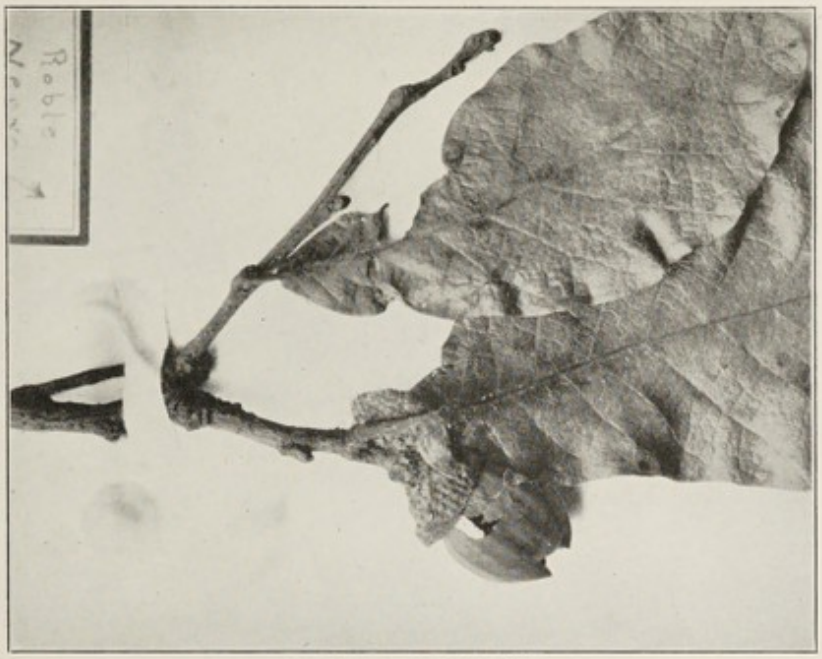
QUERCUS OBTUSATA PANDURATA.



QUERCUS OBTUSATA.



QUERCUS PANDURIFORMIS.

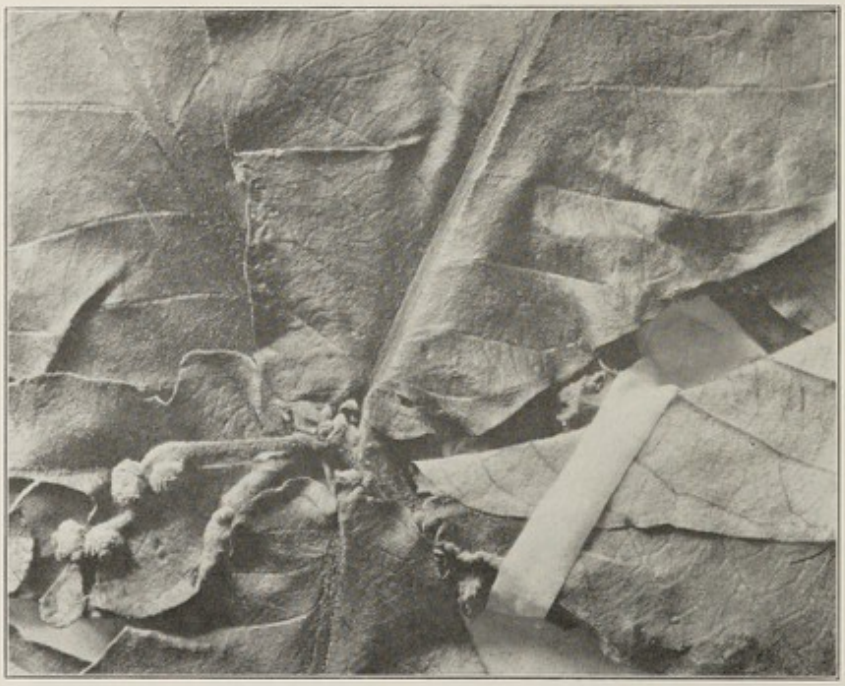


QUERCUS PANDURIFORMIS.

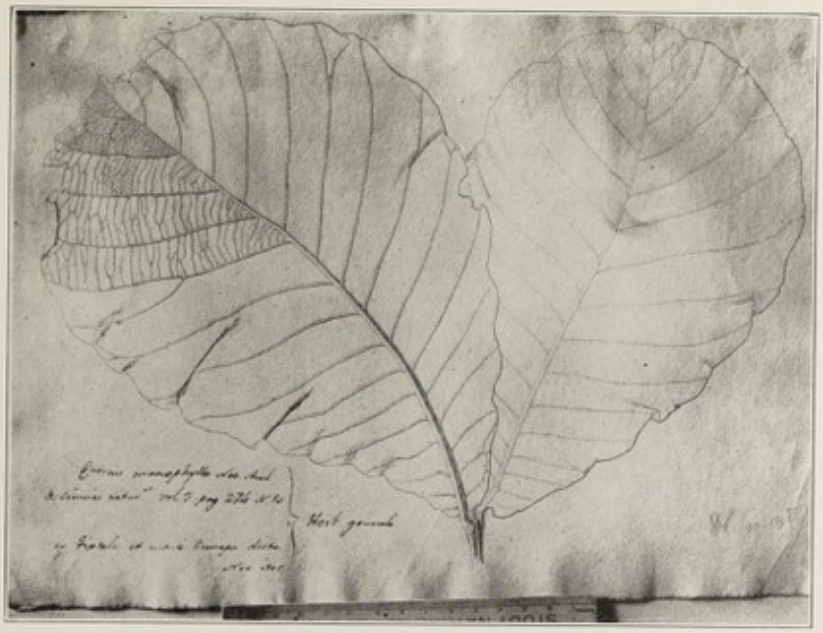


QUERCUS PANDURIFORMIS COLIMENSIS.





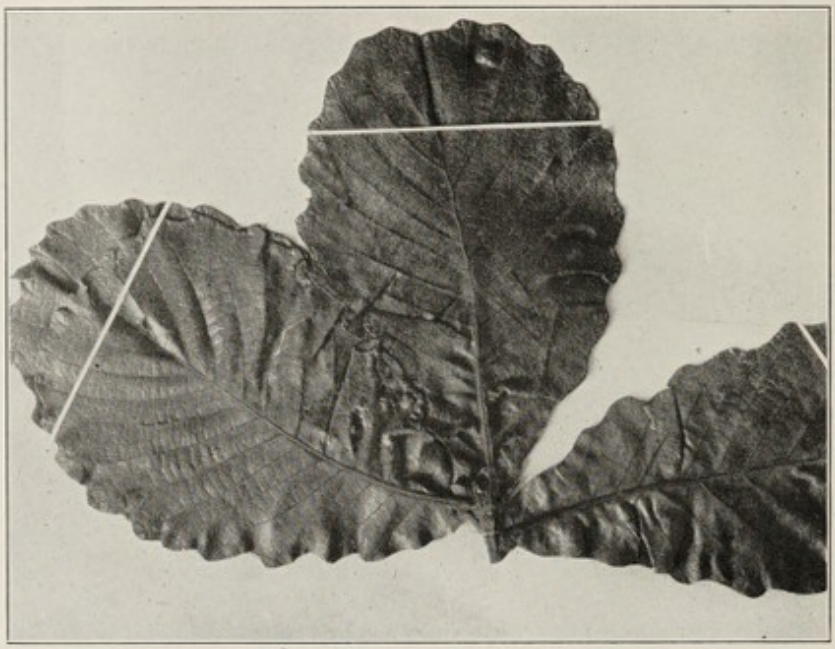
QUERCUS PURULHANA.

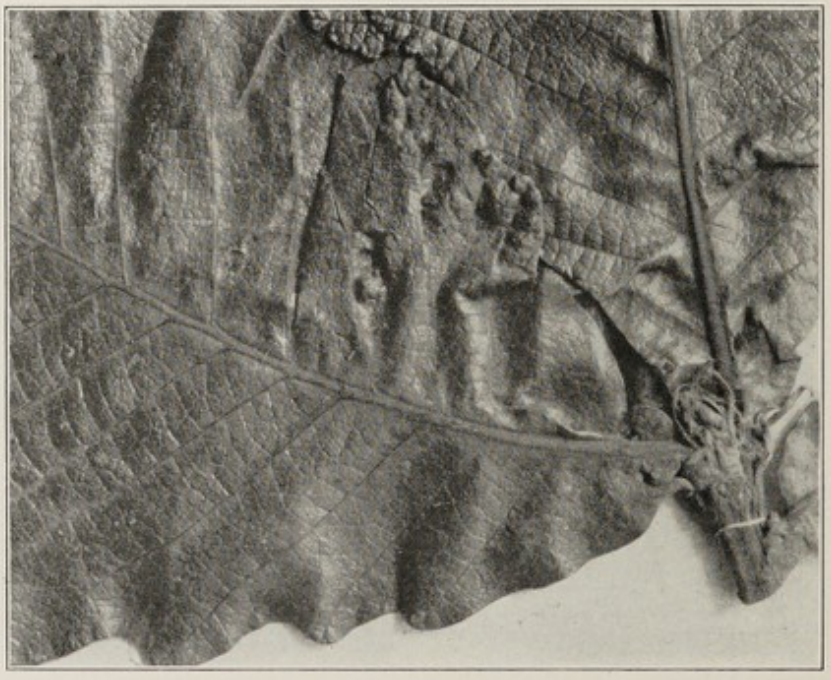




QUERCUS MACROPHYLLA.

27837—24——5





QUERCUS MACROPHYLLA.





QUERCUS MACROPHYLLA.





QUERCUS RESINOSA.

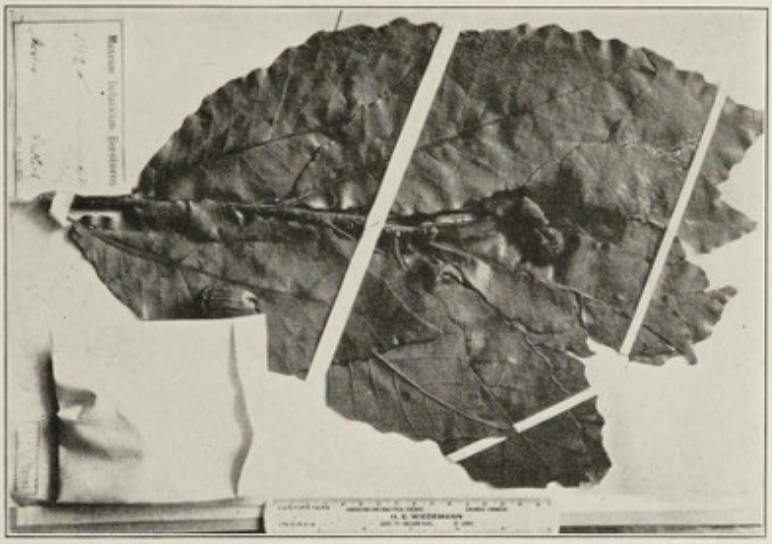


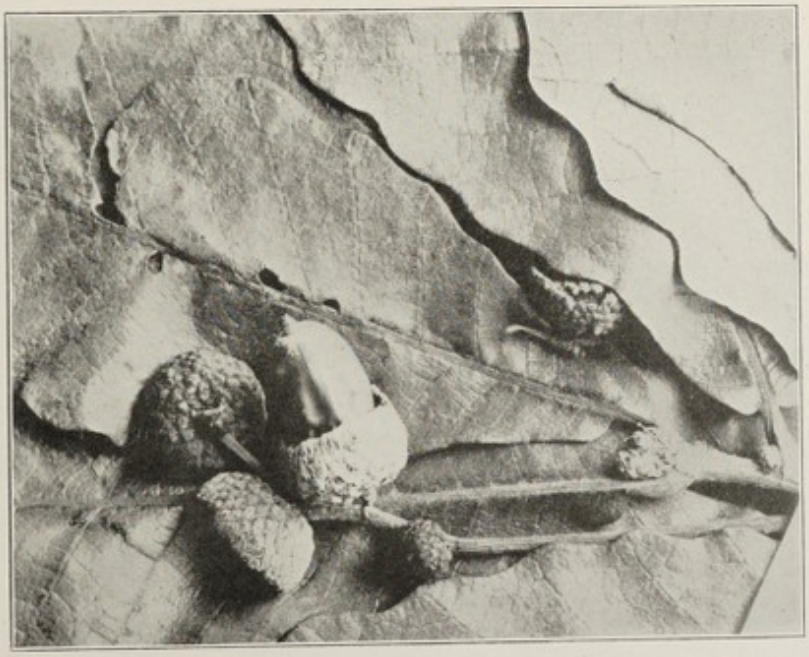
QUERCUS POCULIFER.





QUERCUS NUDINERVIS.



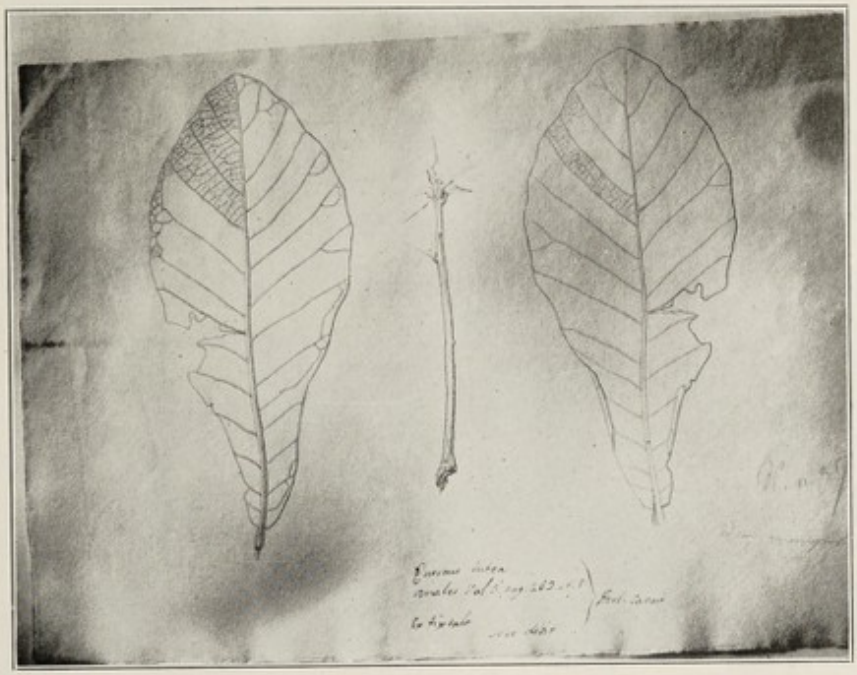


QUERCUS CIRCINATA.





QUERCUS MAGNOLIAEFOLIA.





QUERCUS LUTEA.





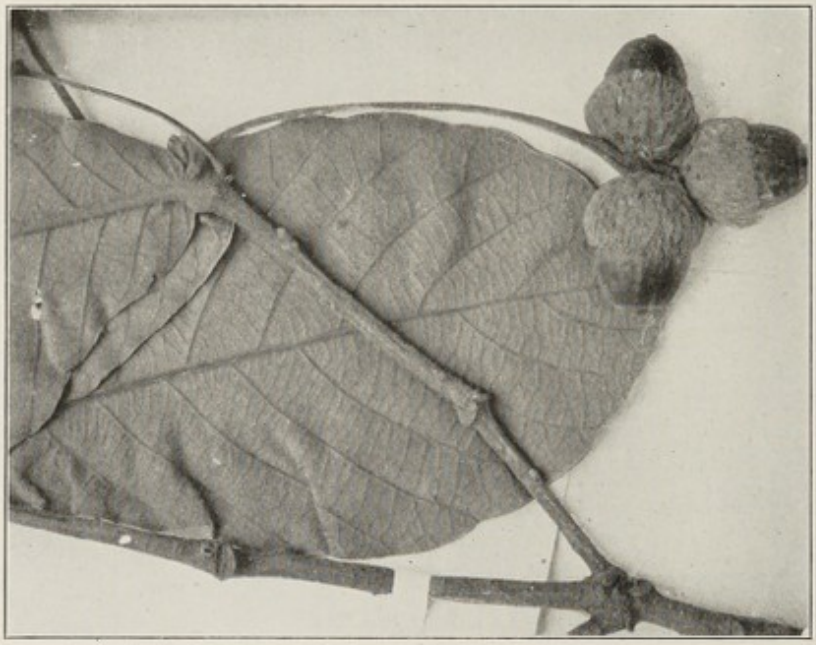
QUERCUS HAEMATOPHLEBIA.

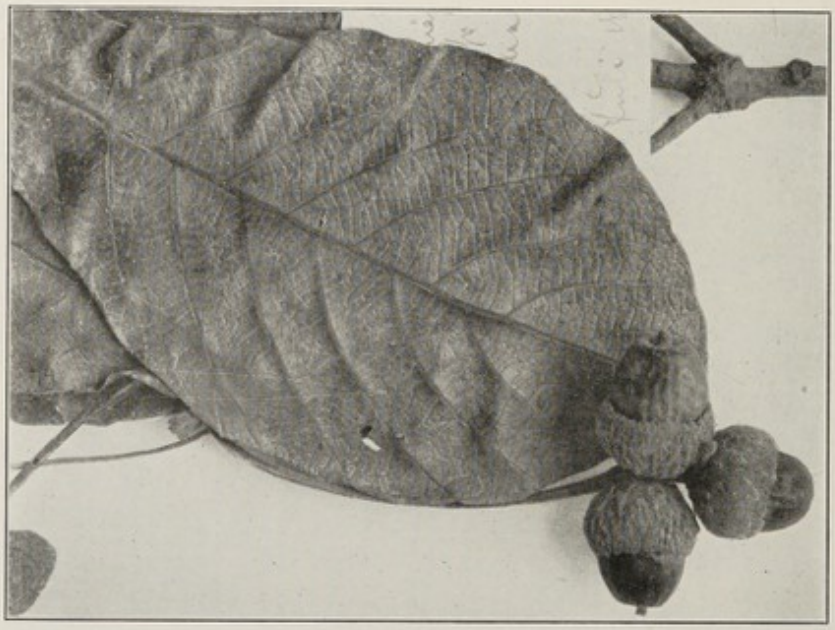


QUERCUS LIEBMANNII.

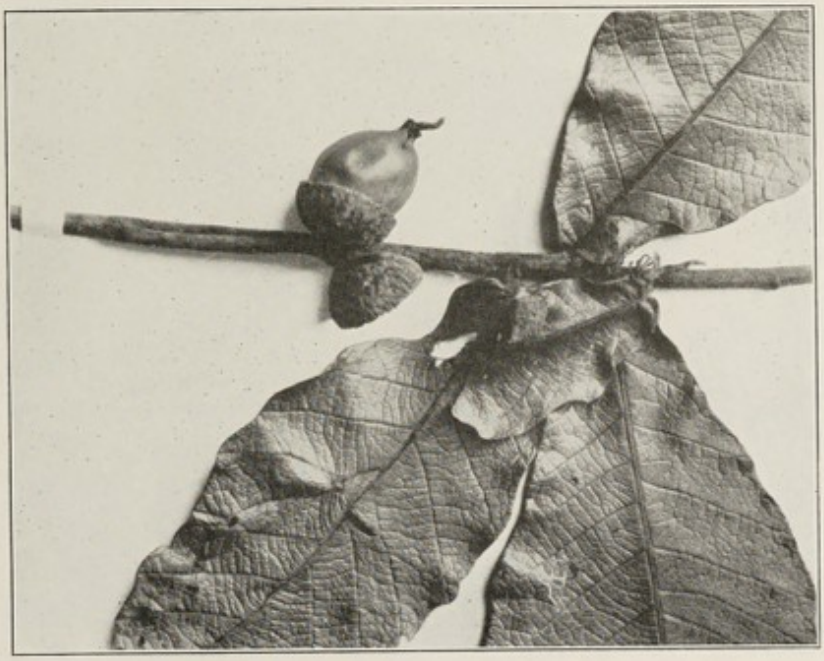


QUERCUS LIEBMANNII BREVIPES.





QUERCUS BARBEYANA.



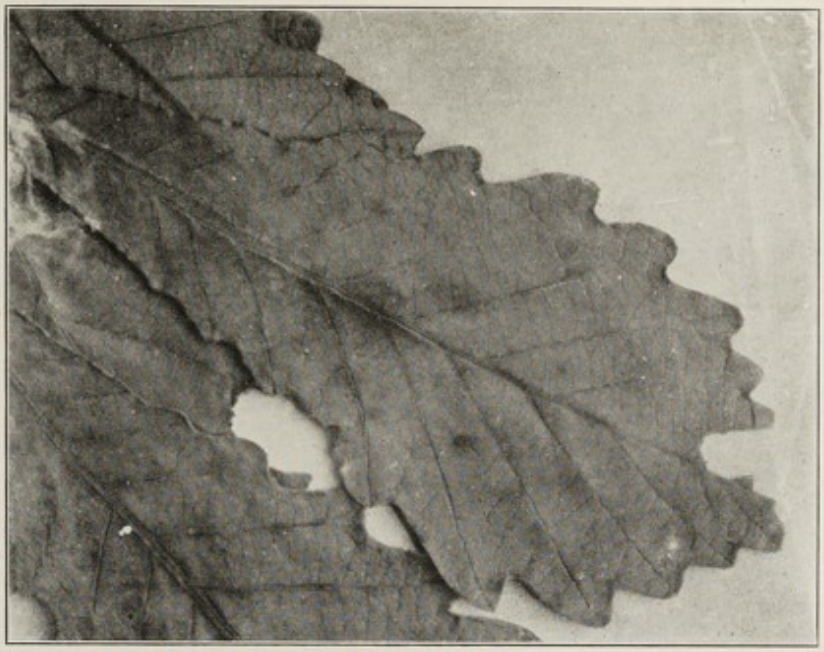


QUERCUS PILICAULIS.





QUERCUS PILICAULIS MACRODONTA.



QUERCUS PILICAULIS OBOVALIS.

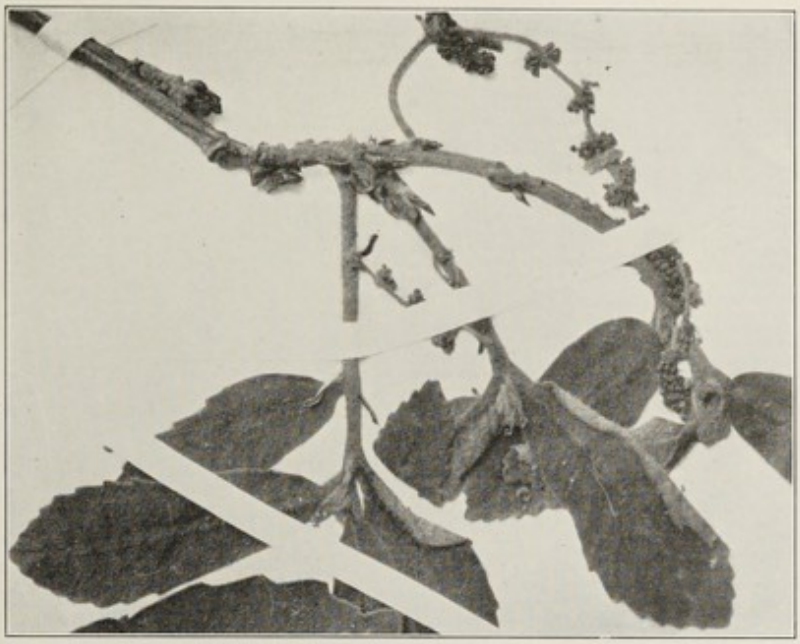


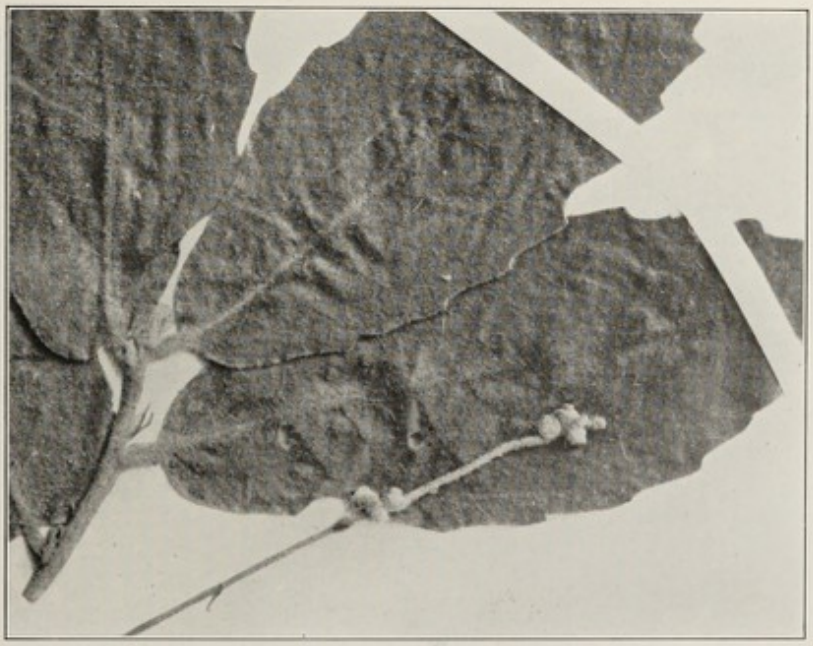
QUERCUS PILICAULIS ARMATA.





QUERCUS PILICAULIS HURTERI.





QUERCUS BARBANTHERS.

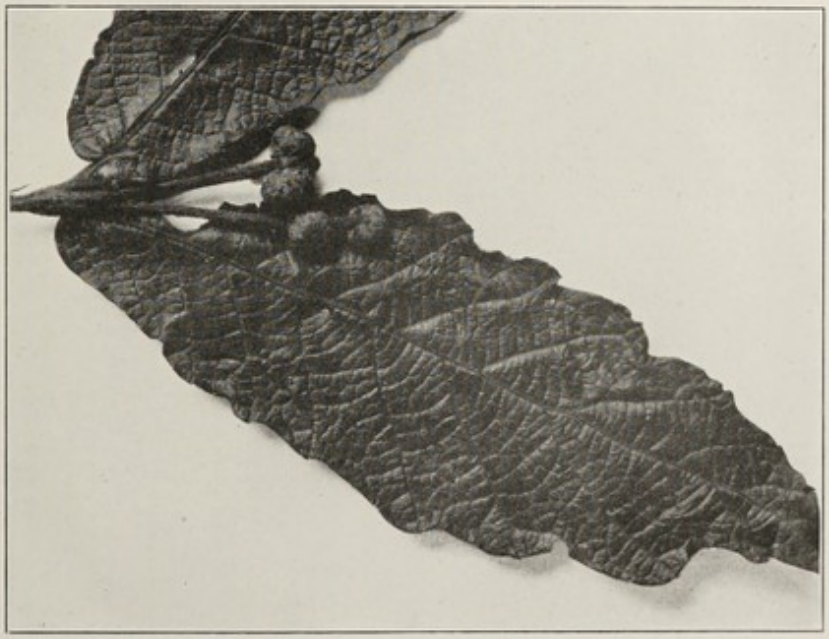
27837—24——6





QUERCUS CALLOSA.





QUERCUS PEDUNCULARIS.



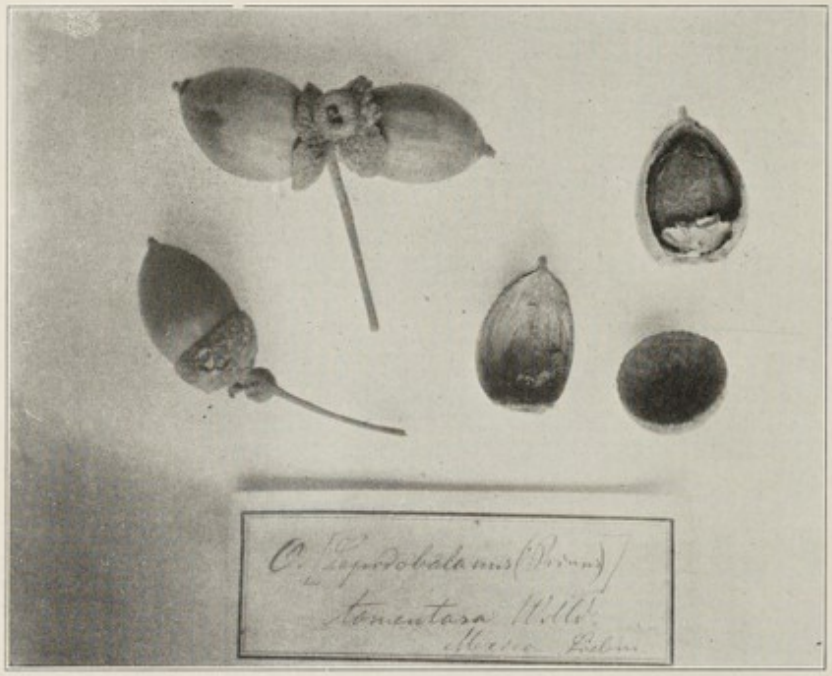


QUERCUS HARTWEGI.





QUERCUS LAXA.



QUERCUS PEDUNCULARIS.



QUERCUS LAETA.



QUERCUS LAETA HETEROPHYLLA.

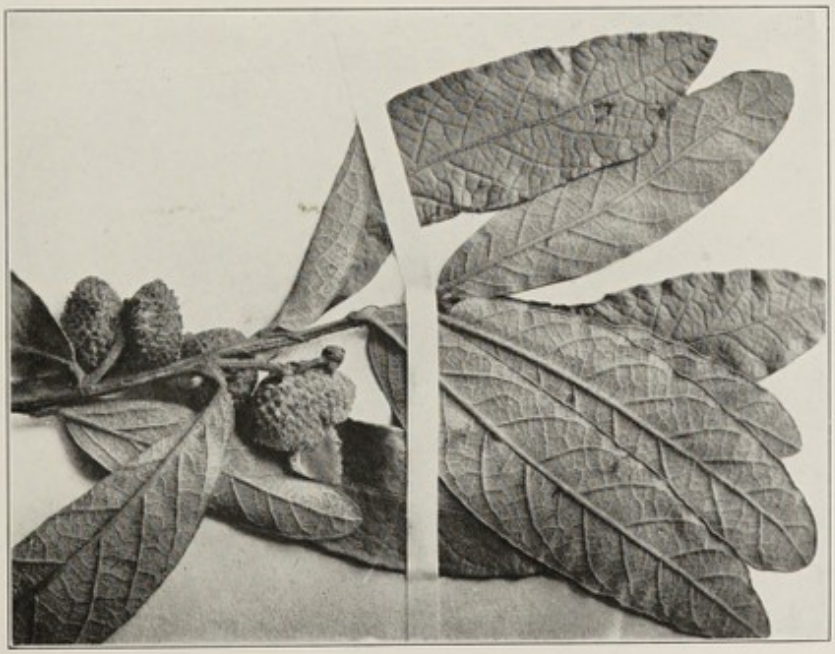




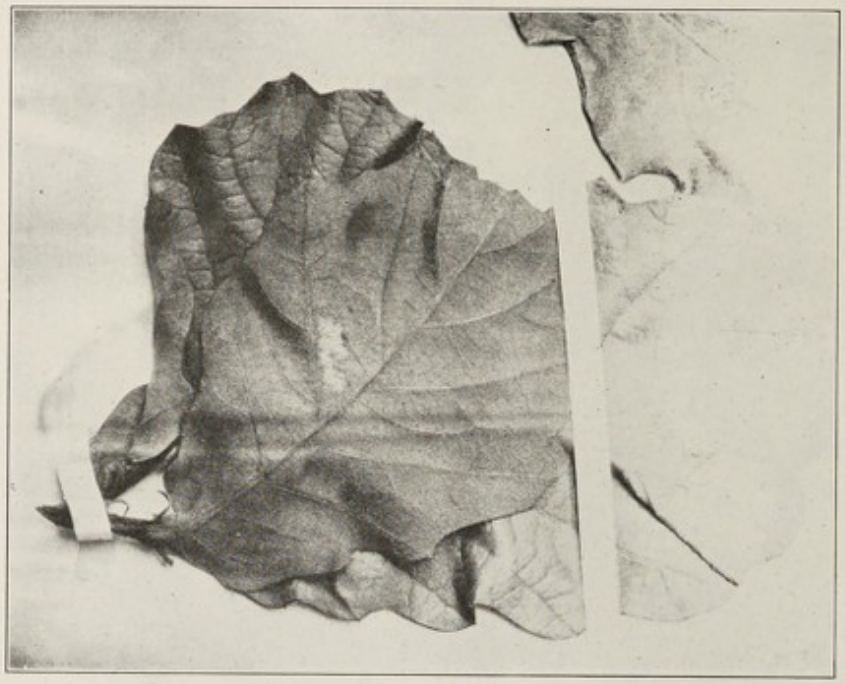
QUERCUS OBSCURA.



QUERCUS OBSCURA PERPUSILLA.



QUERCUS TRANSMONTANA.





QUERCUS VELLIFERA.





QUERCUS DURANGENSIS.



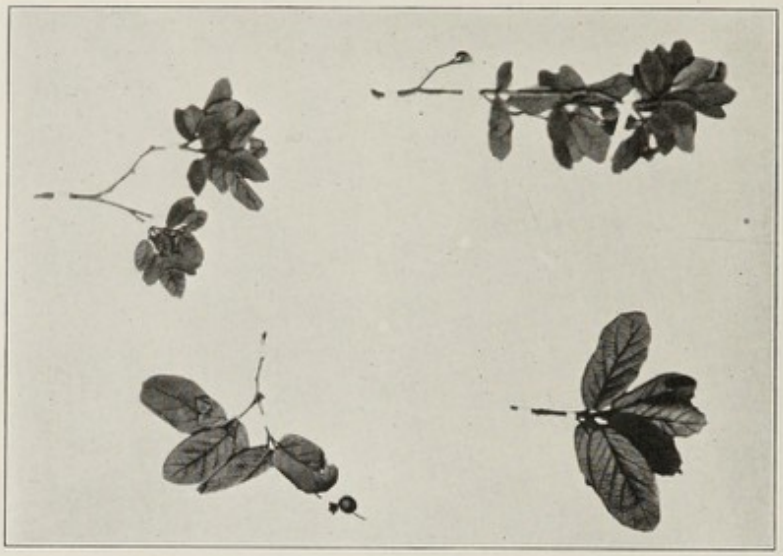


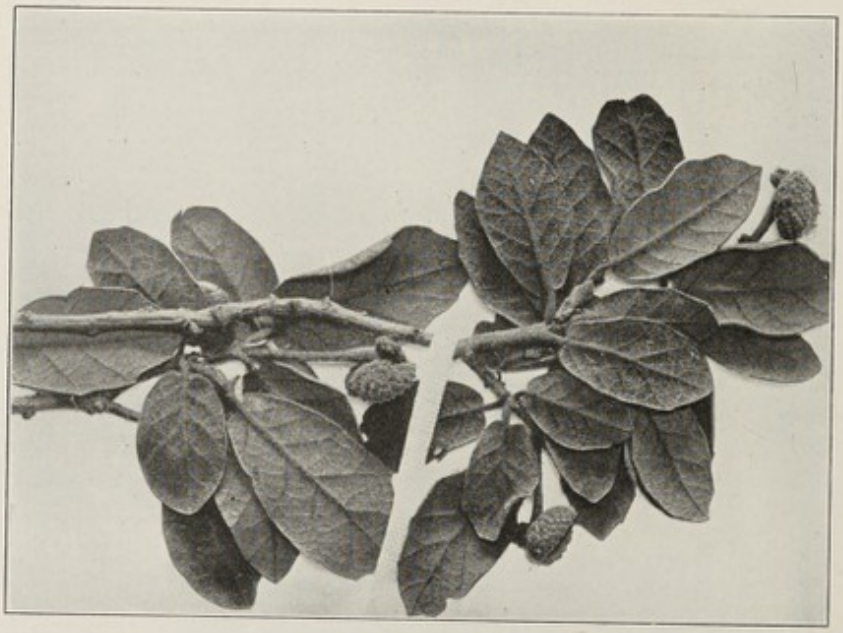
QUERCUS DIVERSICOLOR



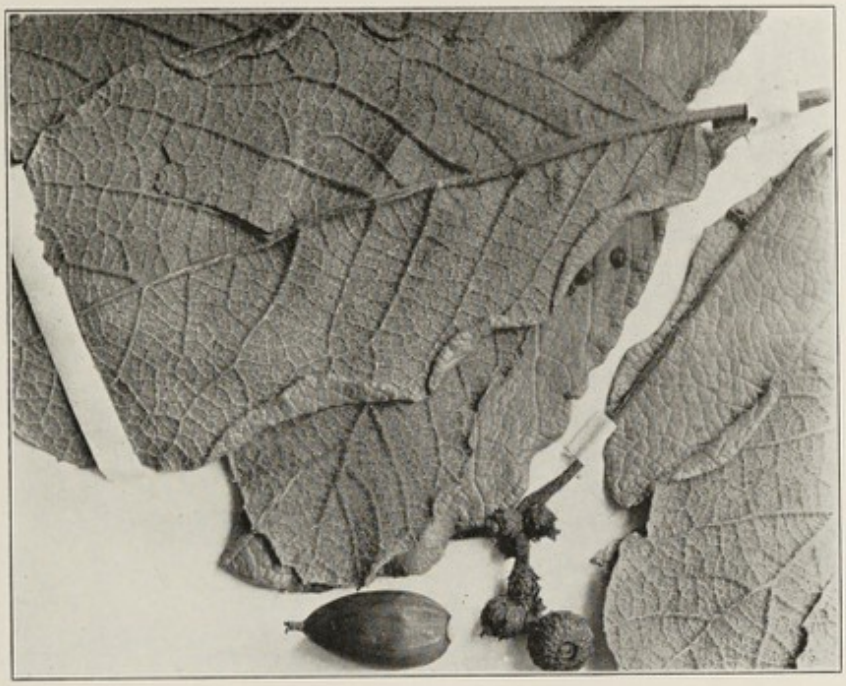


QUERCUS DIVERSICOLOR.





QUERCUS DIVERSICOLOR MEARNSII.



QUERCUS RHODOPHLEBIA.



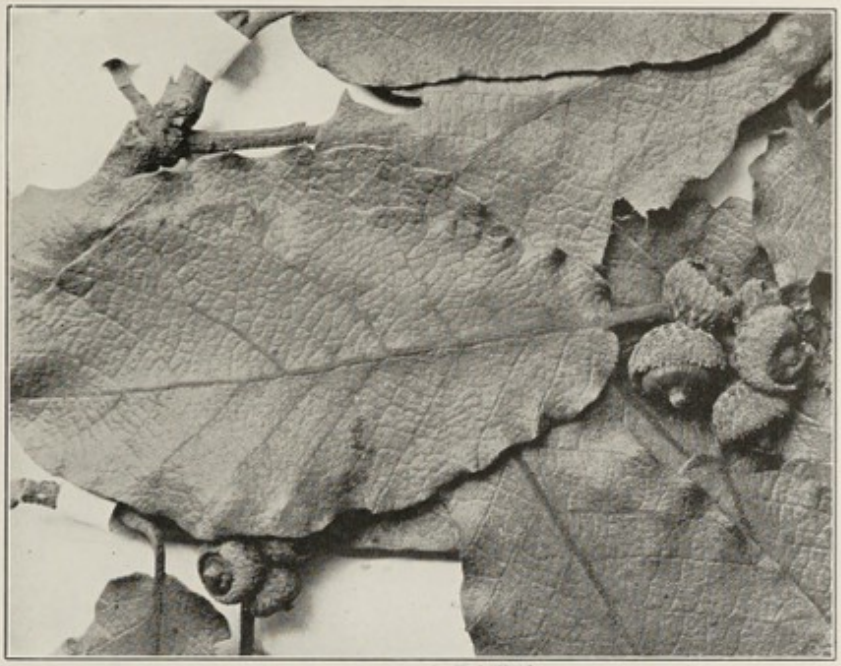
QUERCUS RHODOPHLEBIA CONCAVA.



QUERCUS RHODOPHLEBIA APPLANATA.



QUERCUS RHODOPHLEBIA APUS.



QUERCUS RHODOPHLEBIA INCLUSA.



QUERCUS ARIAEFOLIA.

27837—24——7



QUERCUS RETICULATA.



QUERCUS RETICULATA DUGESI.



QUERCUS RETICULATA LONGA.



QUERCUS RETICULATA SQUARROSA



QUERCUS UHDEANA.





QUERCUS RUGOSA.



QUERCUS RUGOSA.



QUERCUS BONPLANDIANA.



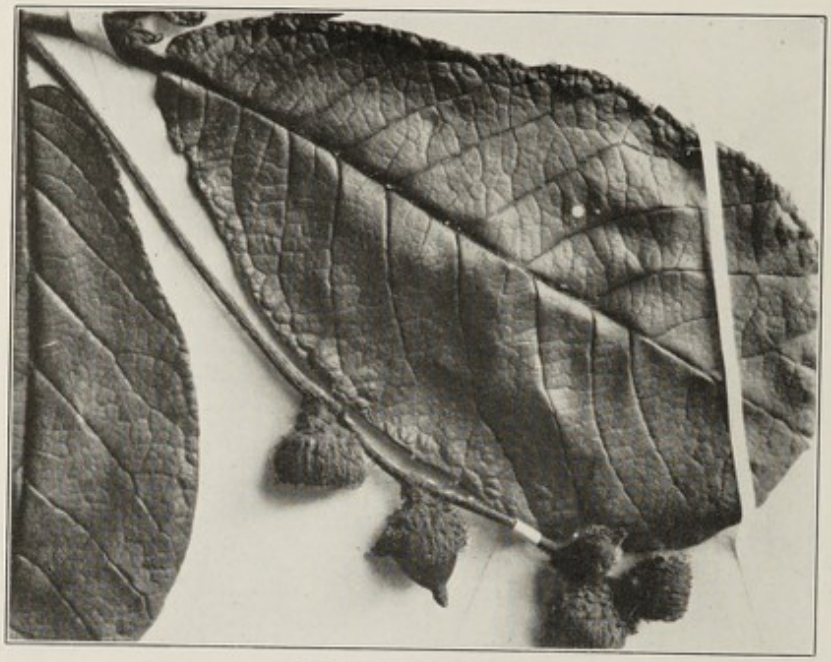


QUERCUS ALVAREZENSIS.

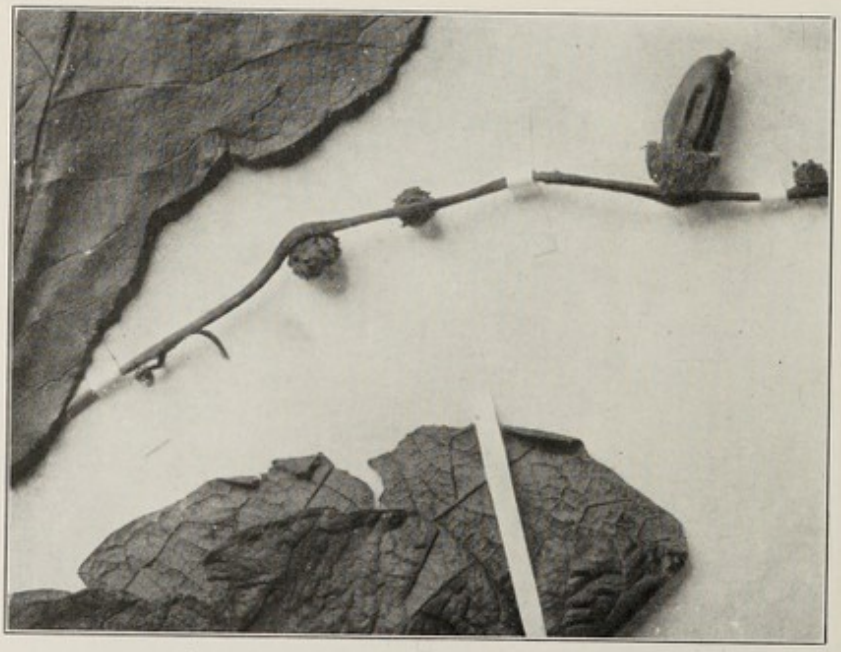




QUERCUS PURPUSII.



QUERCUS CONGLOMERATA.



QUERCUS DECIPIENS.



QUERCUS DECIPIENS.



QUERCUS INNUNCUPATA.





QUERCUS GREGGII.



QUERCUS ACULCINGENSIS.



QUERCUS LOESENERI.





QUERCUS REVOLUTA.





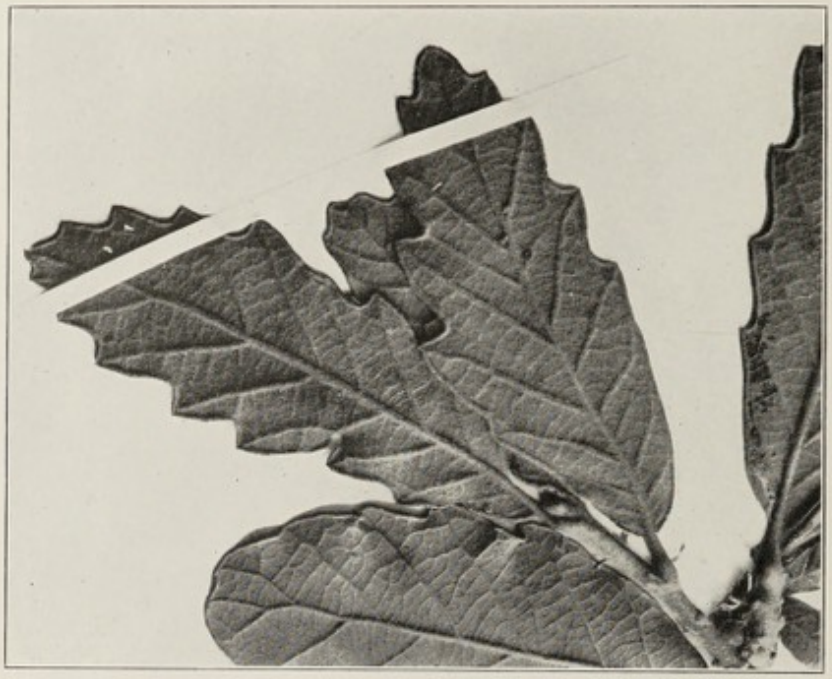
QUERCUS REVOLUTA DYSOPHYLLOPSIS.





QUERCUS DESERTICOLA

27837—24——8



QUERCUS DESERTICOLA INCISA.



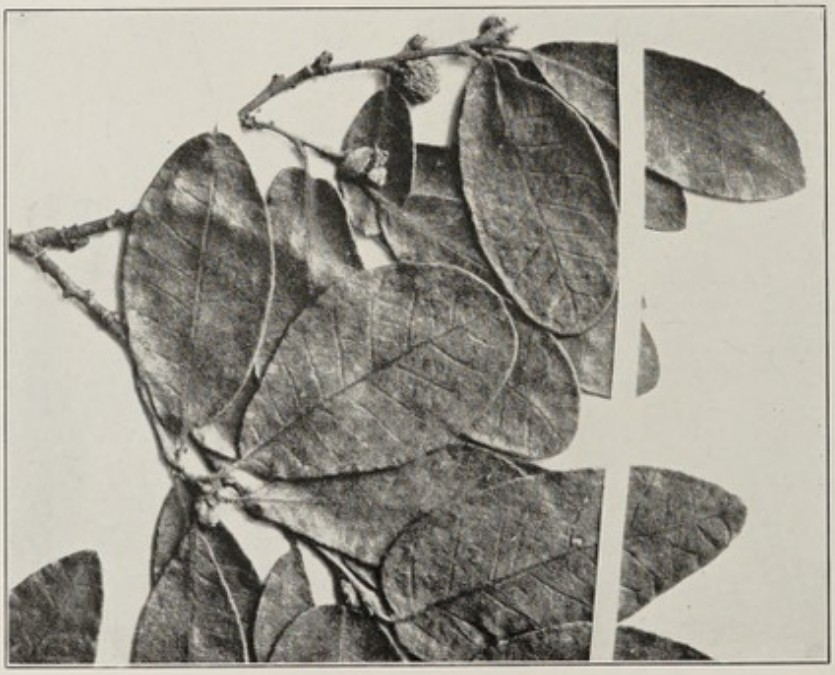
QUERCUS ALVEOLATA.



QUERCUS LECOMTEANA.



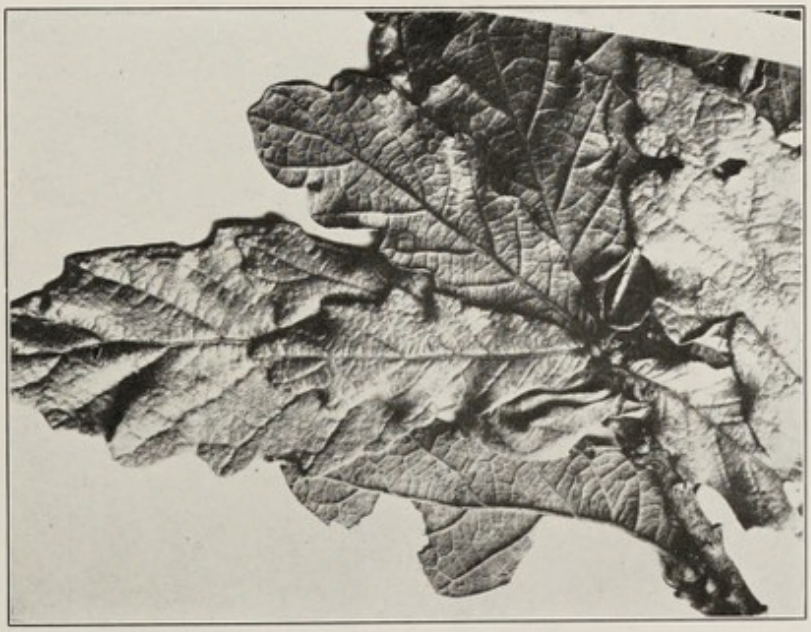
QUERCUS MANZANILLANA.



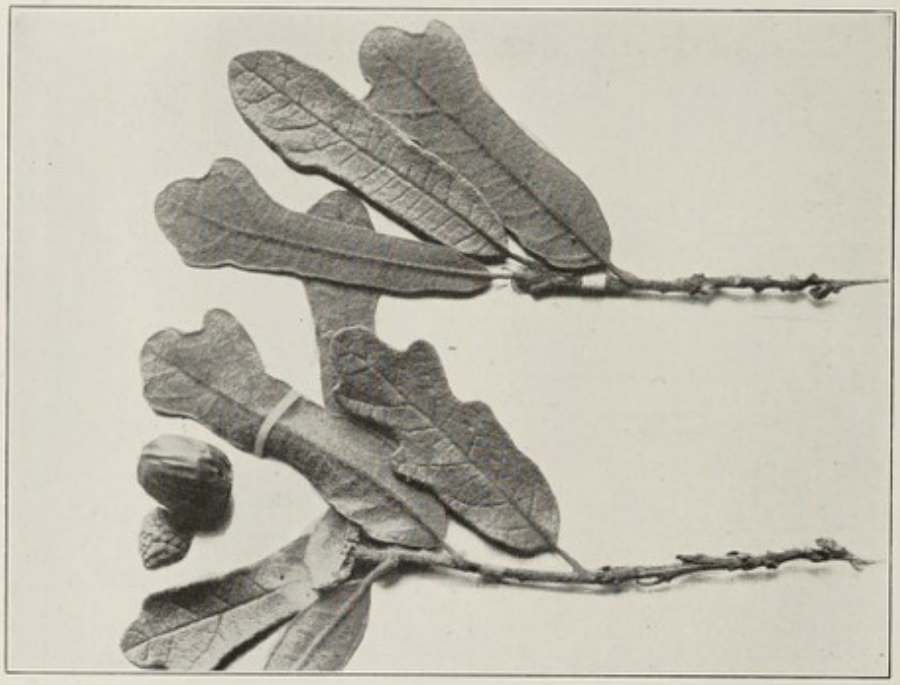
QUERCUS VALLICOLA.

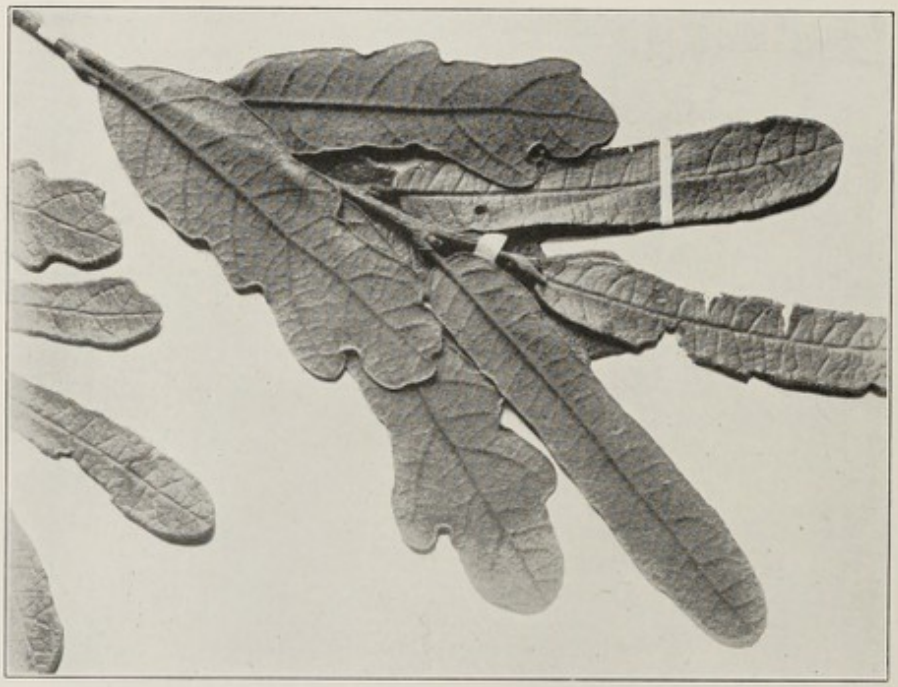


QUERCUS TEXCOCANA.



QUERCUS TEXCOCANA AMPLA.





QUERCUS SUBTRILOBA.



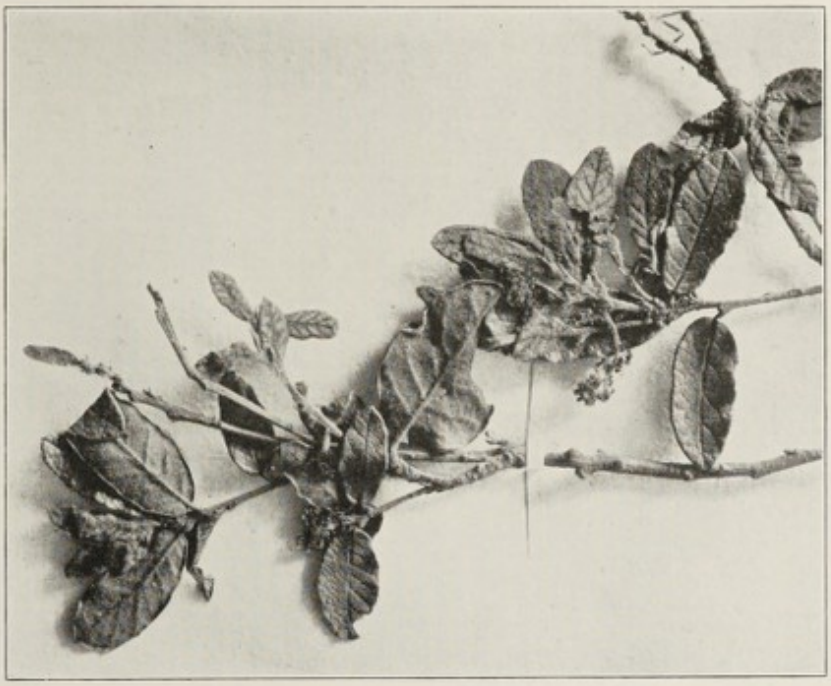


QUERCUS MICROPHYLLA.





QUERCUS FRUTEX.





QUERCUS REPANDA



QUERCUS REPANDA.



QUERCUS ALPESCENS.





QUERCUS POTOSINA.





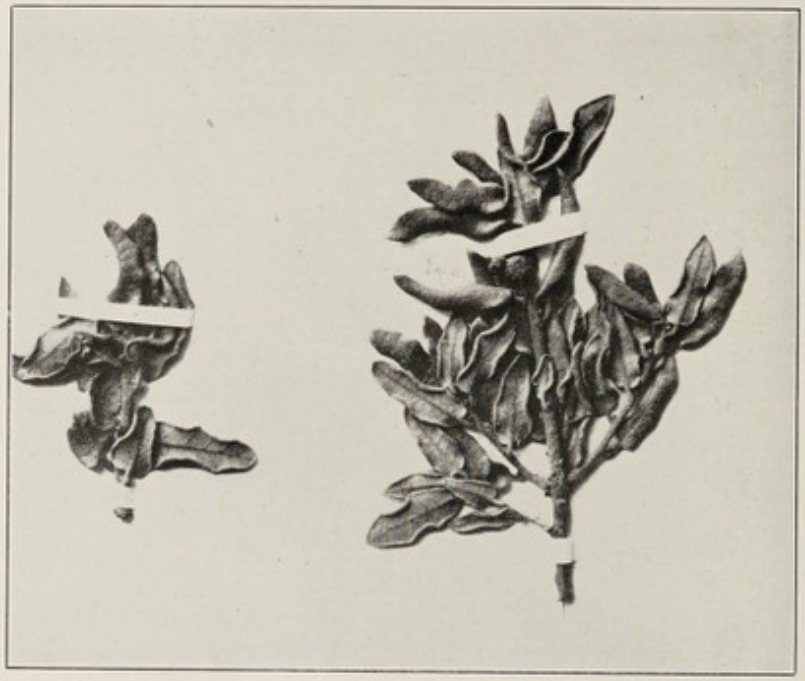
QUERCUS POTOSINA EXILIS.



QUERCUS POTOSINA APERTA.



QUERCUS CORDIFOLIA.





QUERCUS INTRICATA.



QUERCUS INTRICATA.



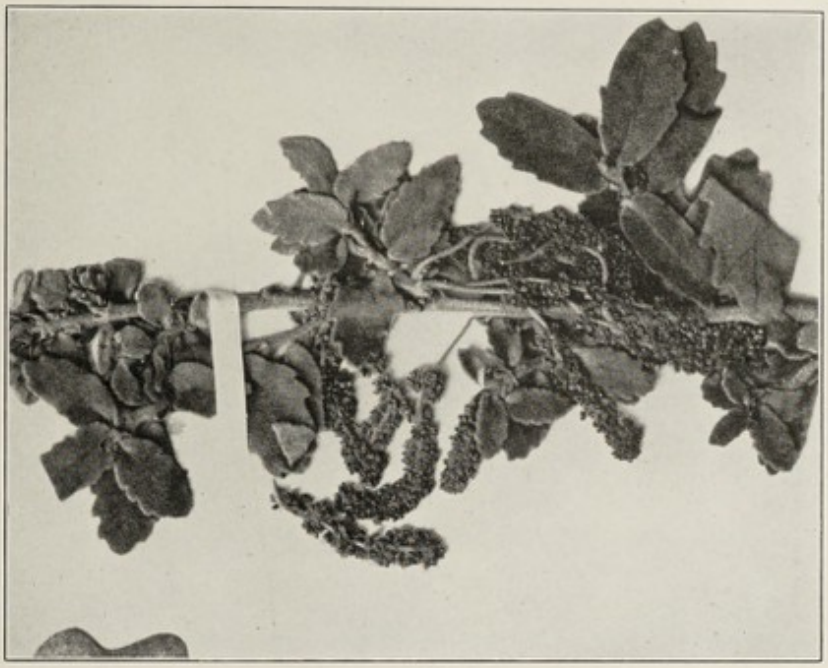
QUERCUS INTRICATA ANGUSTA.



QUERCUS INTRICATA OVATA.



QUERCUS INTRICATA ERRATICA.





QUERCUS CHIHUAHUENSIS.

27837—24——9



QUERCUS CHIHUAHUENSIS.



QUERCUS CHIHUAHUENSIS MICROPHYLLOIDES.



QUERCUS CHIHUAHUENSIS TENUIS.



QUERCUS CHIHUAHUENSIS AMPLIFOLIA.





QUERCUS JALISCENSIS.





QUERCUS JARALENSIS.



QUERCUS JARALENSIS.



QUERCUS JARALENSIS BERLANDIERI.



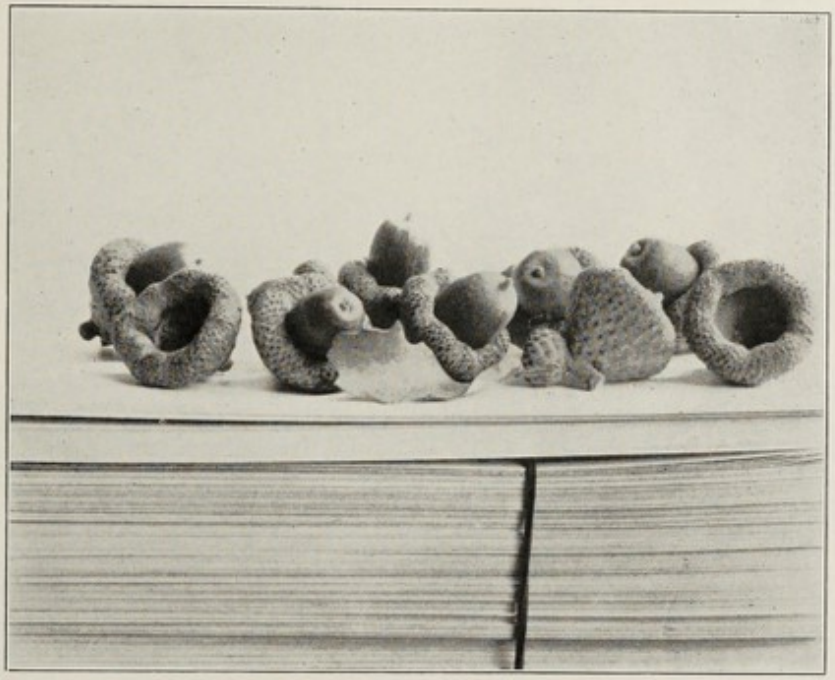


QUERCUS UNDATA.





QUERCUS INFRALUTEA.



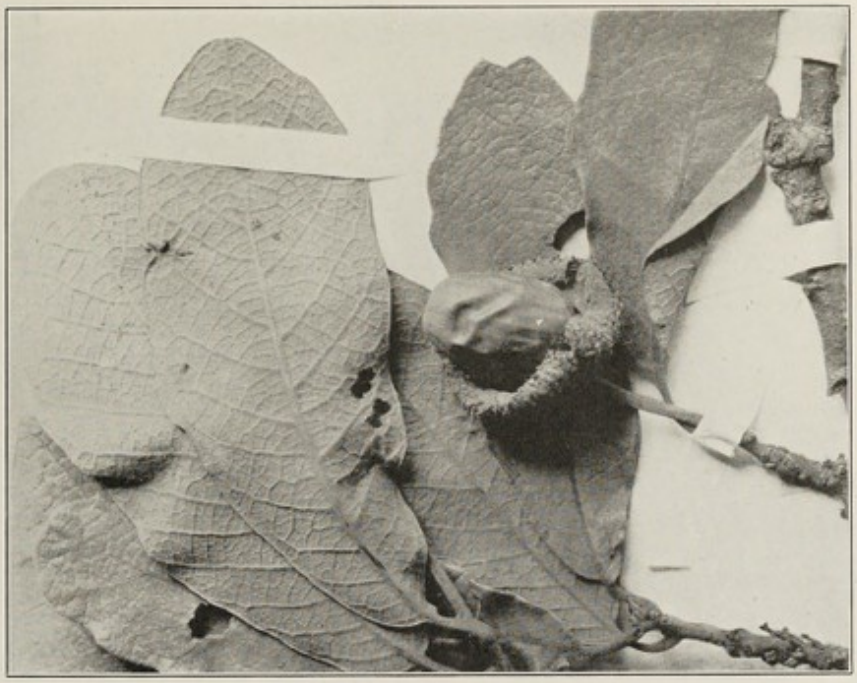
QUERCUS INVAGINATA.



QUERCUS INVAGINATA.



QUERCUS INVAGINATA PURPUSIANA.

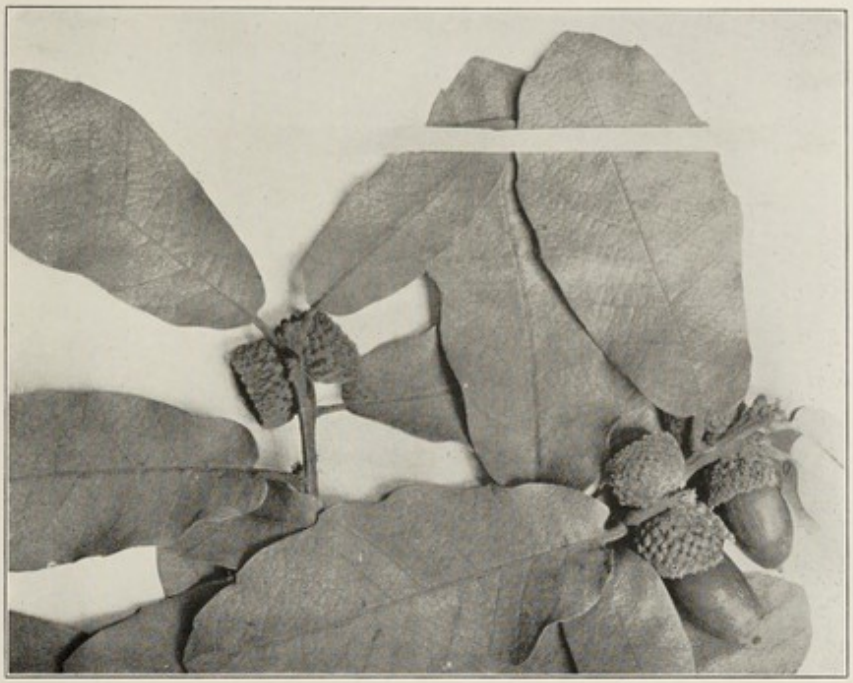




QUERCUS PRAECO.



QUERCUS CONVALLATA.



QUERCUS ARIZONICA.



QUERCUS PALLESCENS.

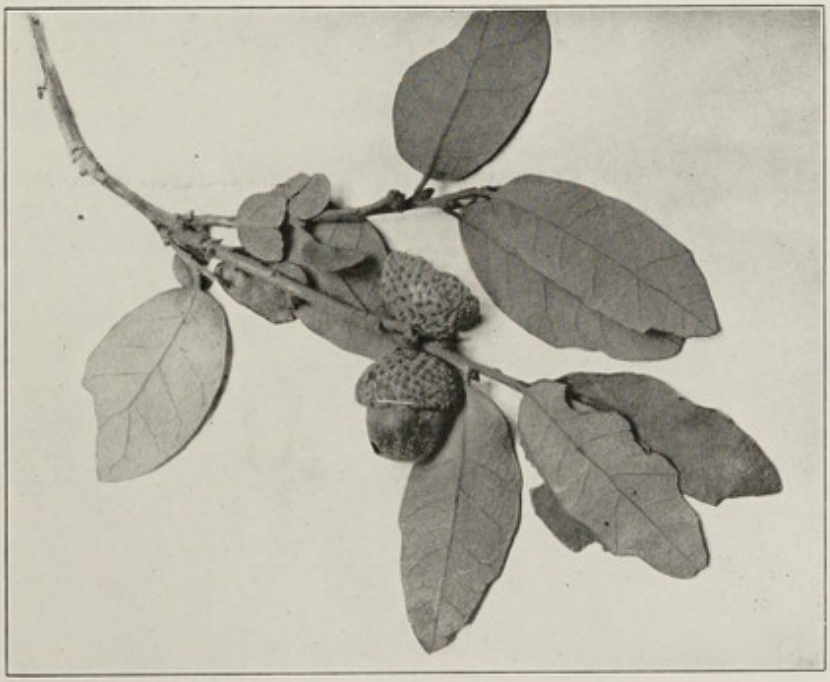




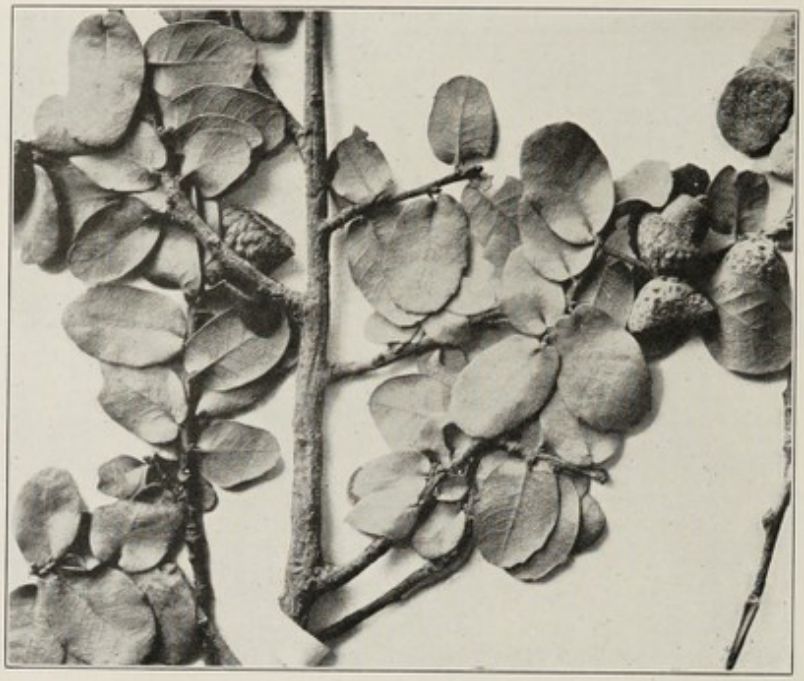
QUERCUS SACAME.



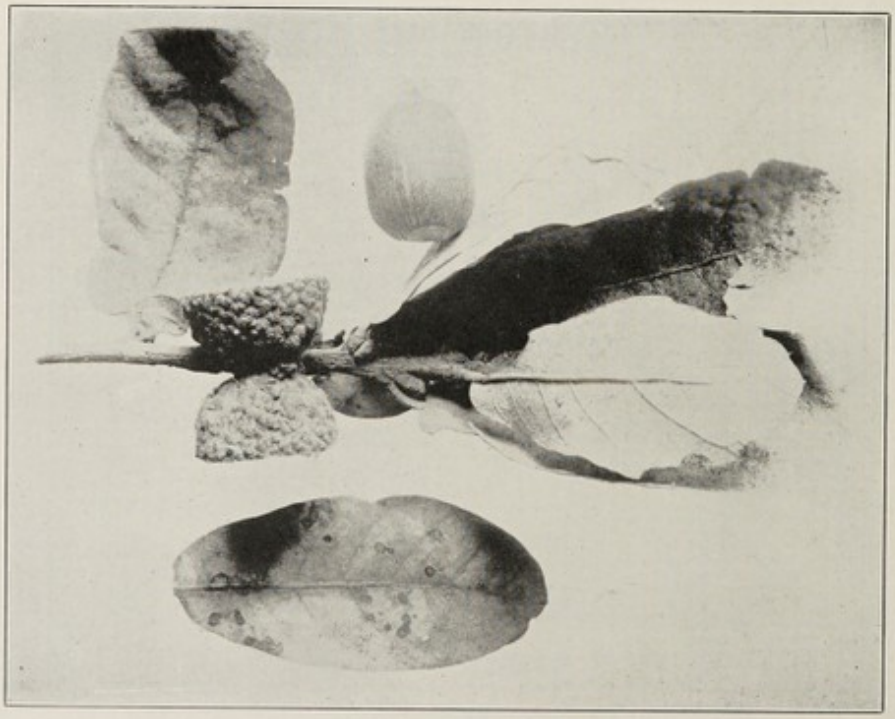
QUERCUS BIPEDALIS.



QUERCUS MOHRIANA.

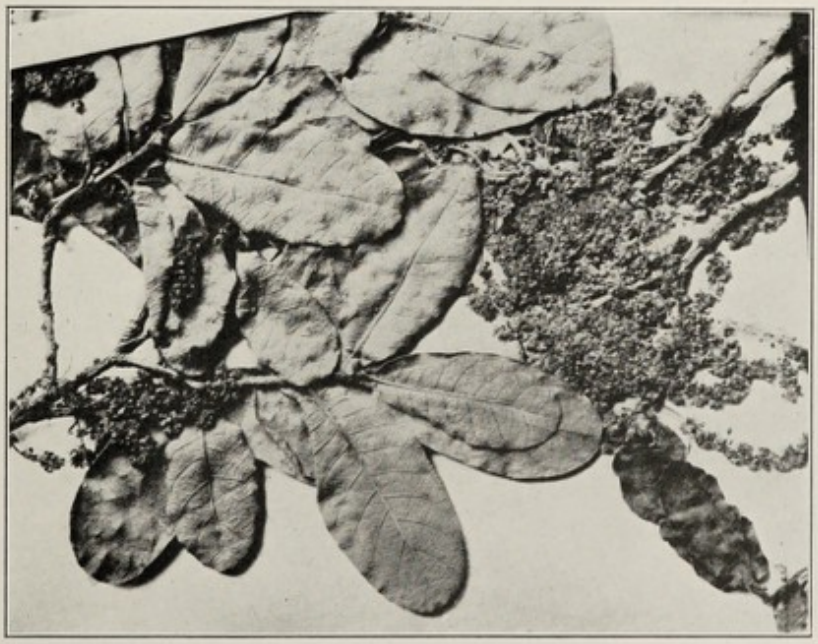


QUERCUS DEPRESSIPES.



QUERCUS ENGELMANNI.





QUERCUS OBLONGIFOLIA.

27837—24——10



QUERCUS OBLONGIFOLIA.



QUERCUS OBLONGIFOLIA PALLIDINERVIS.



QUERCUS PERPALLIDA.



QUERCUS PRINGLEI.



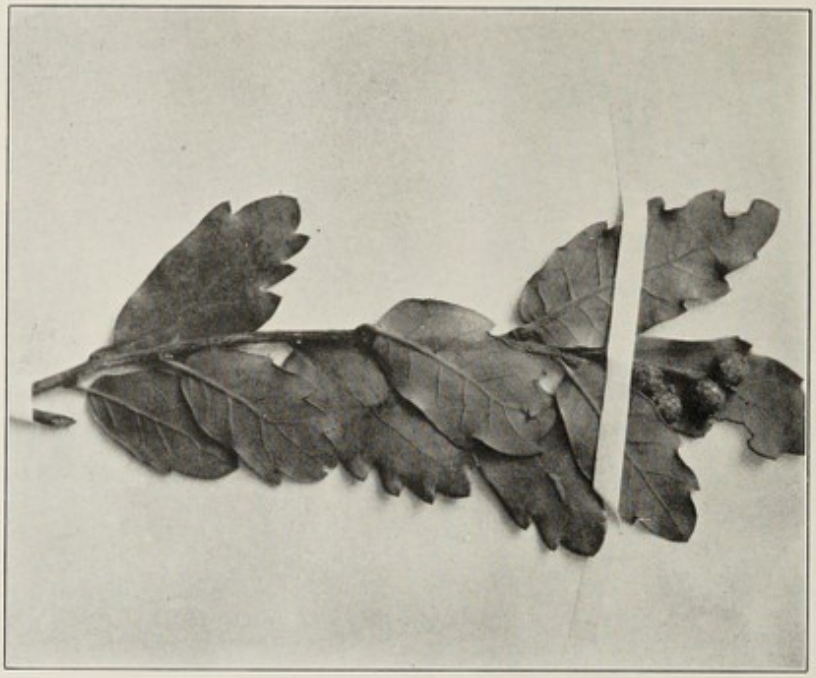
QUERCUS OPACA.



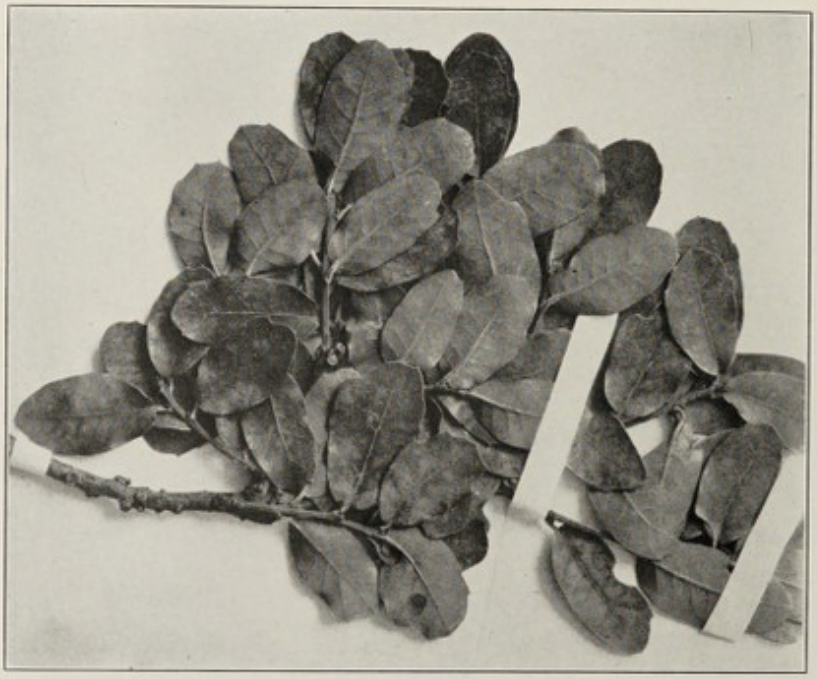
QUERCUS SEBIFERA.



QUERCUS SEBIFERA COMITANENSIS.



QUERCUS SCHENCKIANA.



QUERCUS CERIPES.





QUERCUS STRIATULA.



QUERCUS STRIATULA OTINAPENSIS.



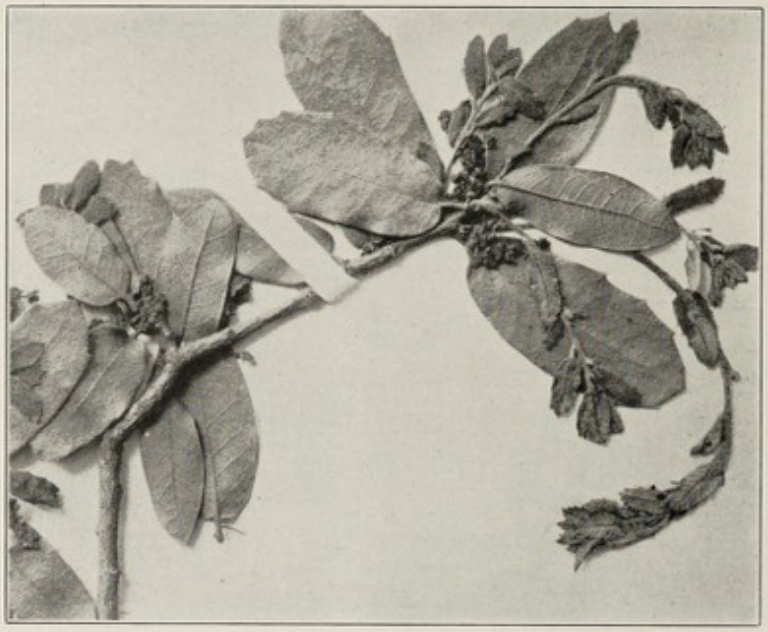
QUERCUS GRISEA.



QUERCUS TOUMEYI.



QUERCUS SUBTURBINELLA.





QUERCUS HARTMANI.



QUERCUS RYDBERGIANA.



QUERCUS UNDULATA.



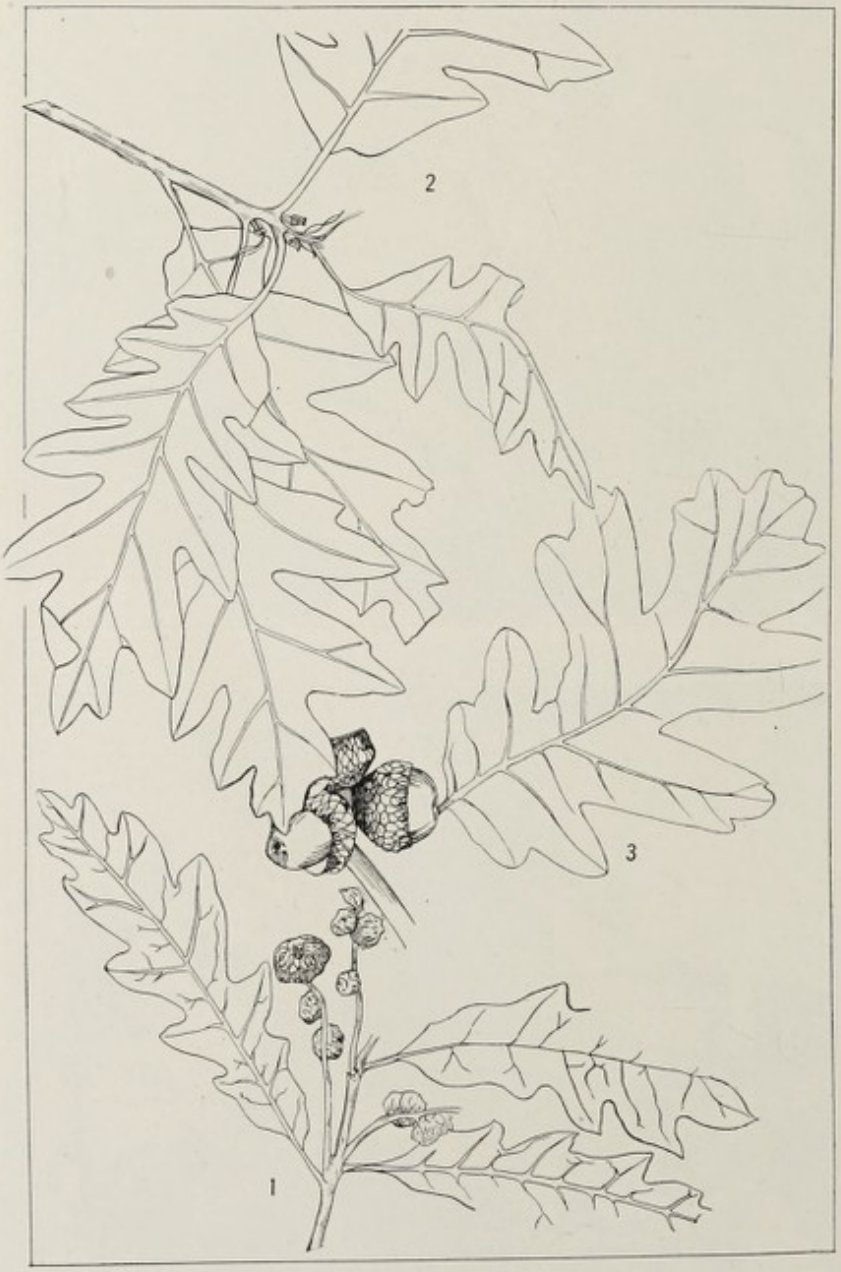


QUERCUS UNDULATA VASEYANA.



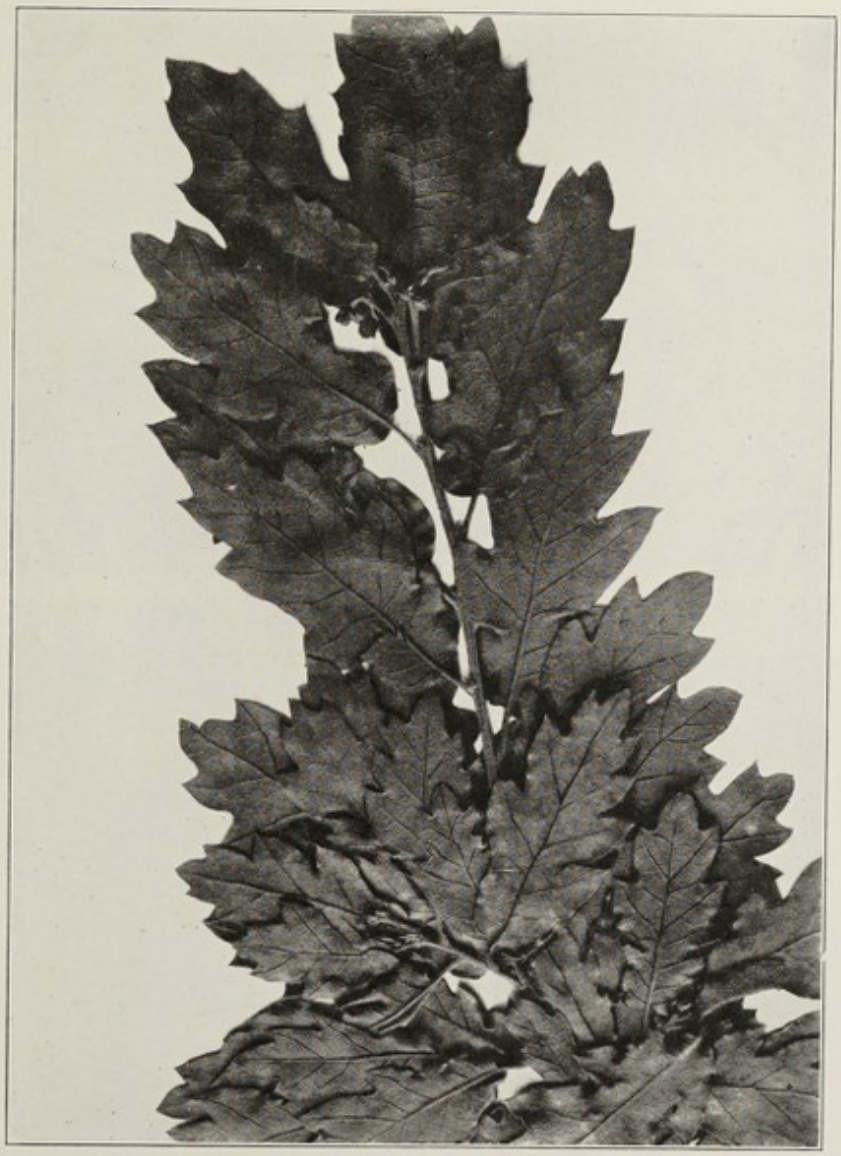


QUERCUS UNDULATA PUNGENS.



CONFUSAE AND GAMBELIEAE.

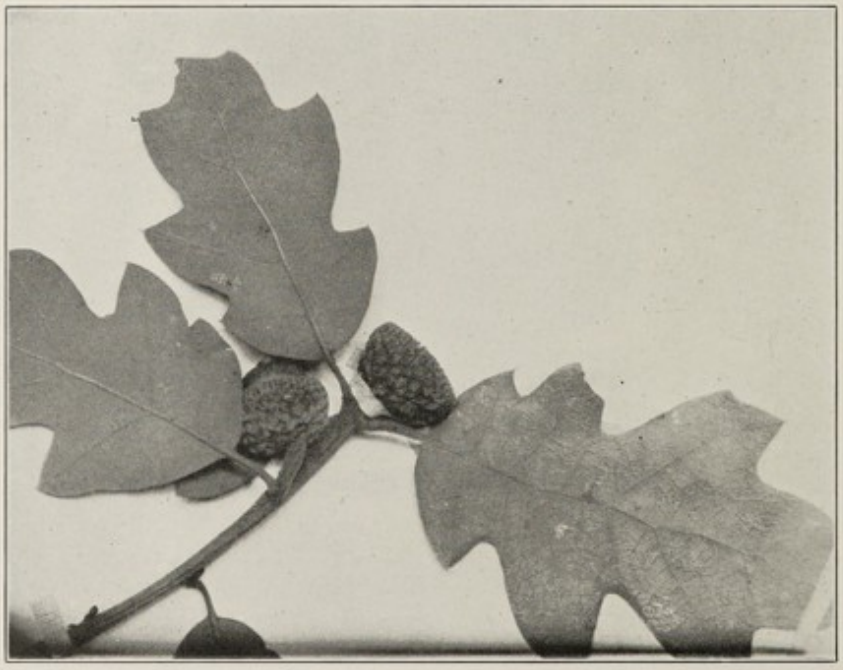
Quercus venustula (1), Quercus Gambelii (2), Quercus Utahensis (3).



QUERCUS FENDLERI.



QUERCUS HAVARDI.



QUERCUS PAUCILOBA.



QUERCUS CONFUSA.



QUERCUS MEDIA.

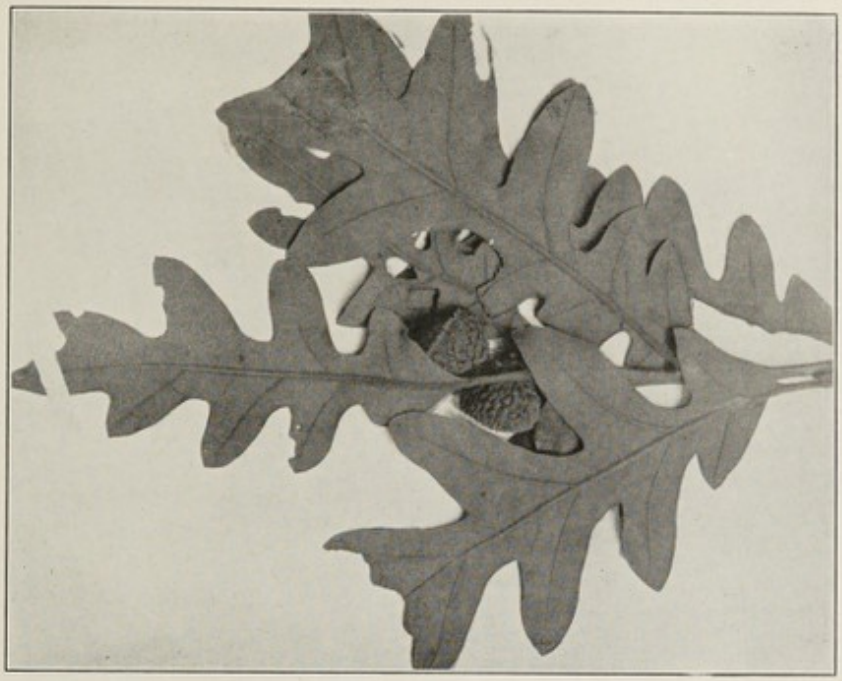
27837—24——11



QUERCUS OBTUSIFOLIA.



QUERCUS EASTWOODIAE.



QUERCUS SUBMOLLIS.



QUERCUS LEPTOPHYLLA.



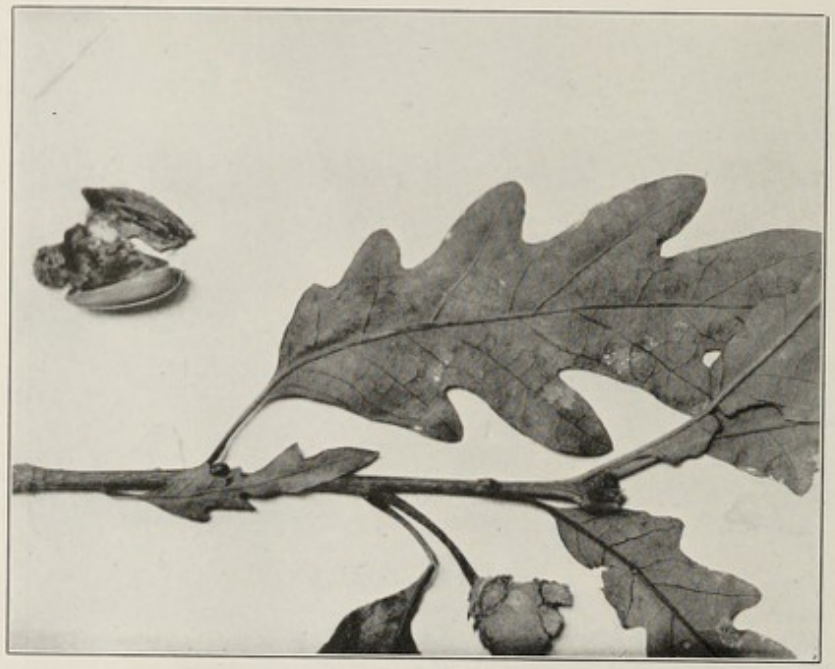
QUERCUS NITESCENS.



QUERCUS NOVOMEXICANA ANDREWSII.



QUERCUS NOVOMEXICANA.



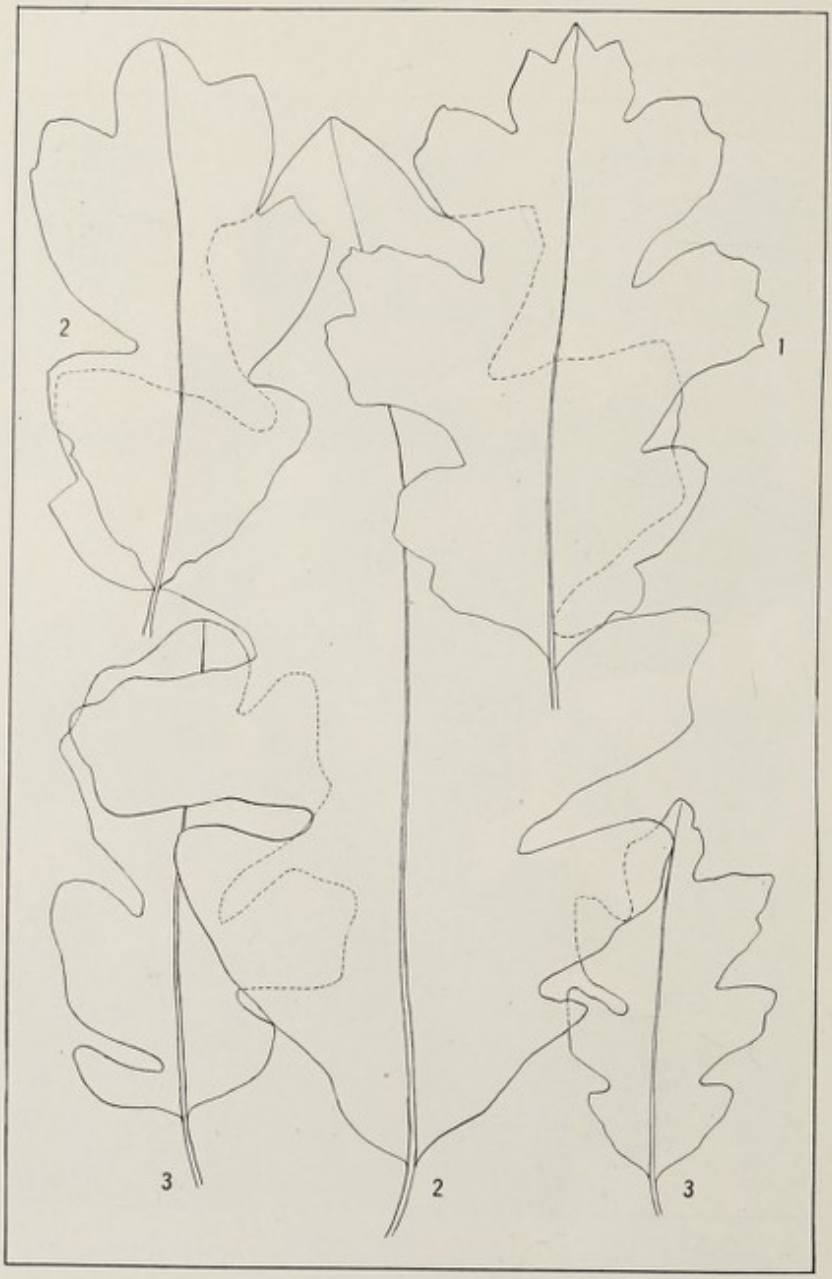
QUERCUS GUNNISONII.



QUERCUS VREELANDII.

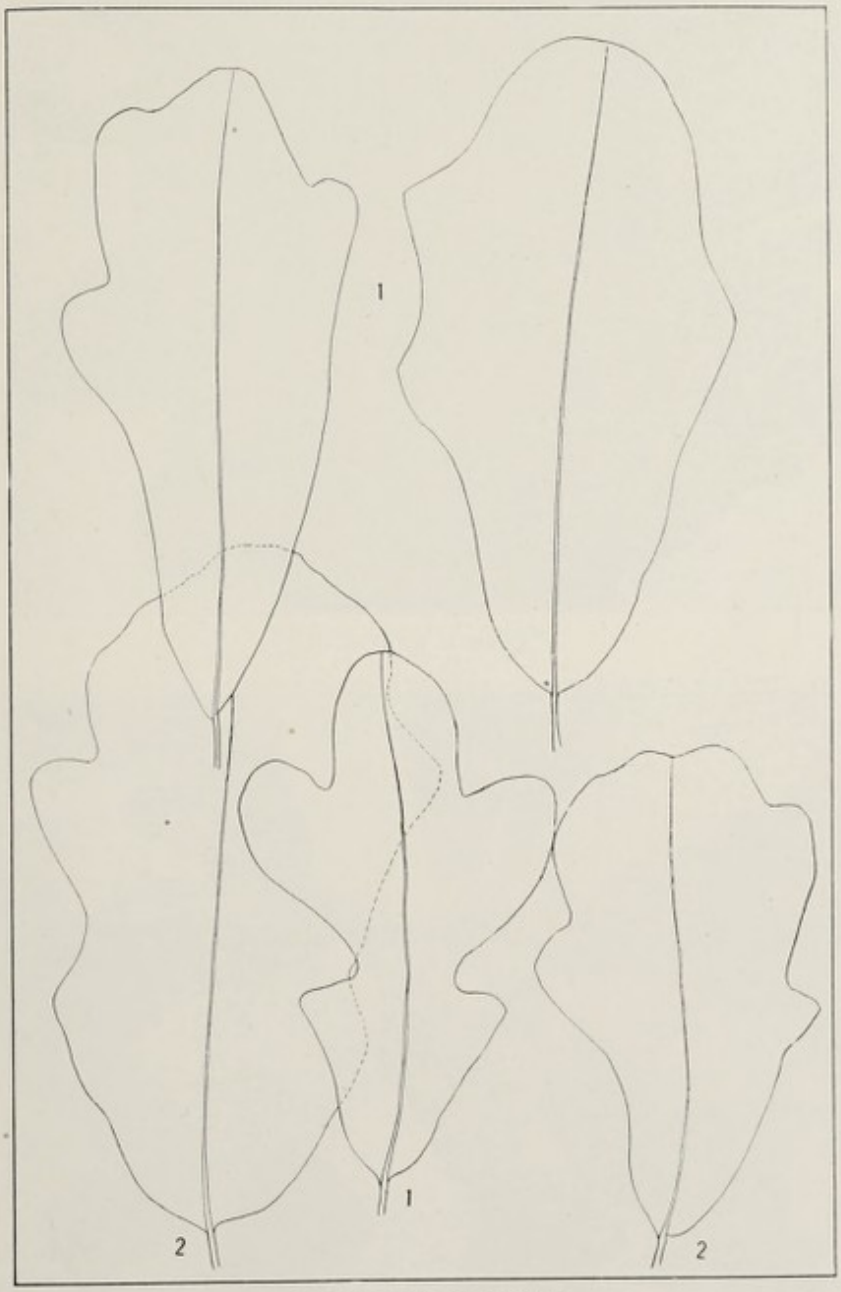


QUERCUS GARRYANA.



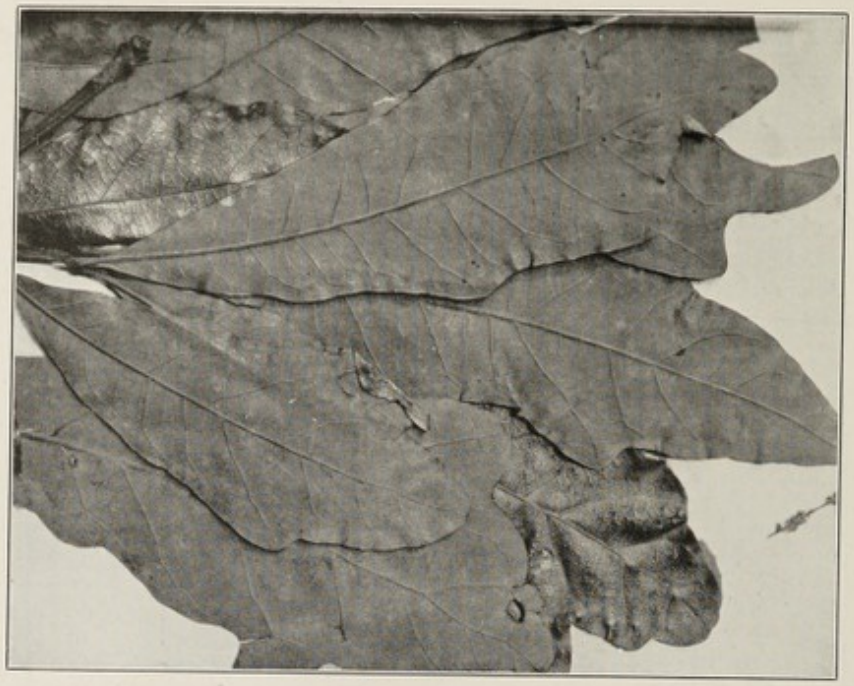
QUERCUS—THE LOBATAE.

Q. lobata (1), Q. Garryana (2), Q. Oerstediana (3).

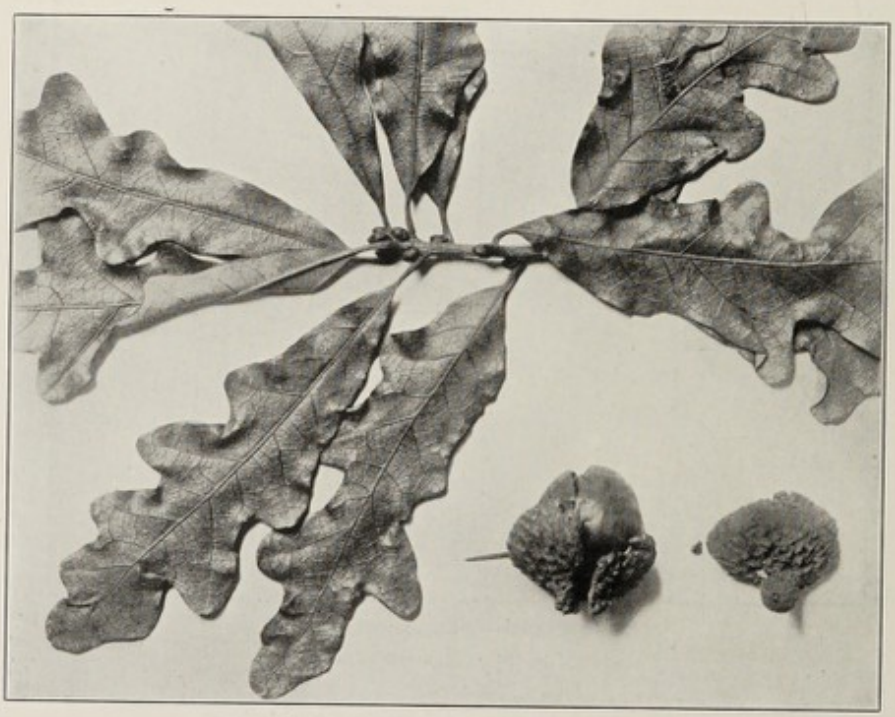


QUERCUS—THE DURANDIEAE.

Q. sinuata (1). Q. breviloba (2).



QUERCUS SINUATA.



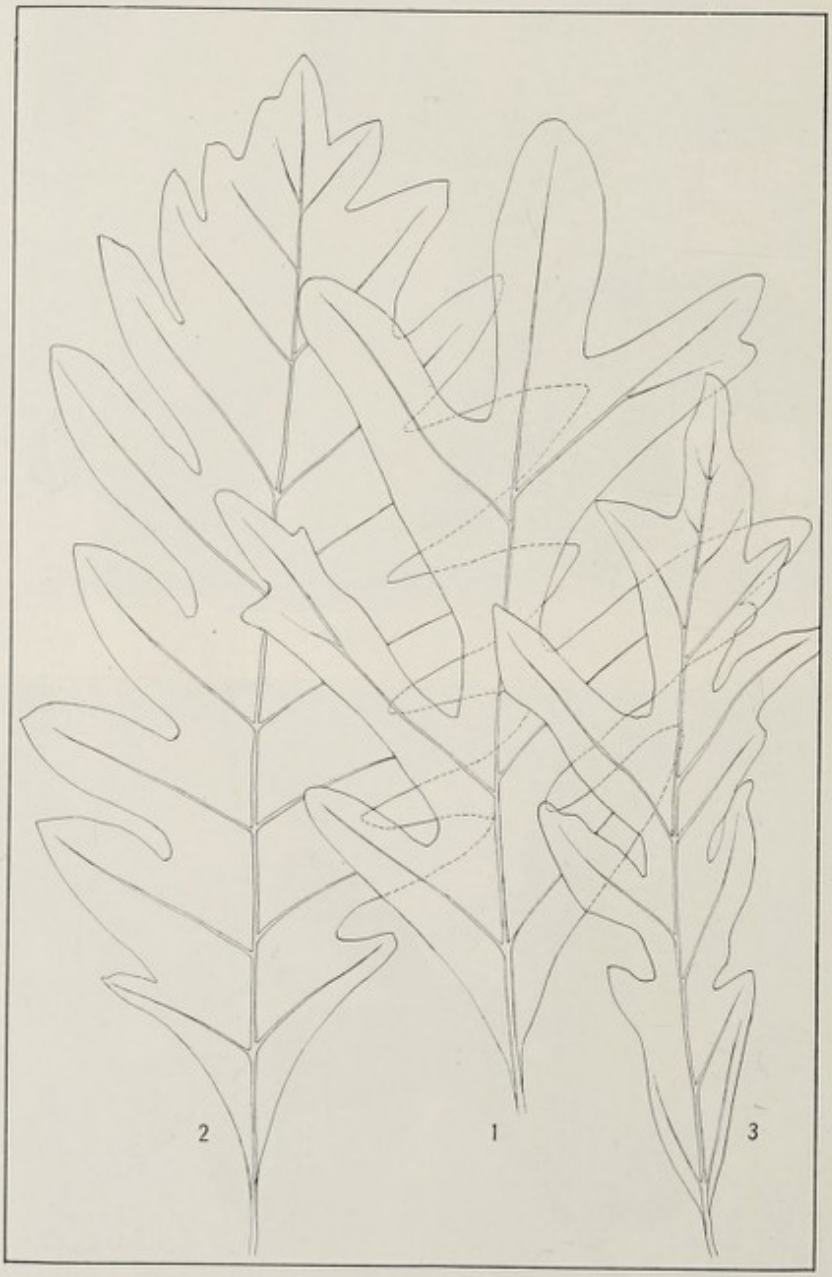
QUERCUS BREVILOBA ARGENTATA.



QUERCUS SINUATA DURANDII.



QUERCUS SILLAE.



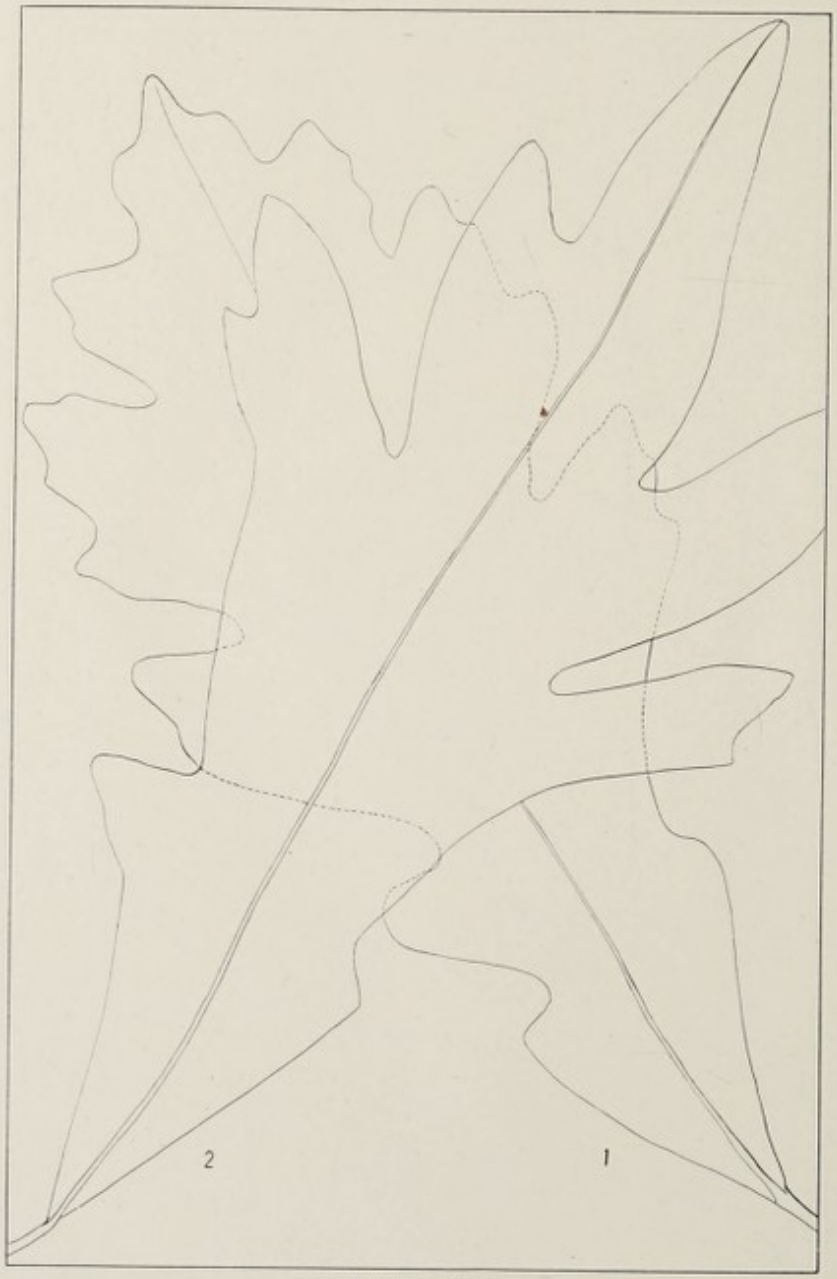
QUERCUS ALBA.

f. typica (1), f. Ryderi (2), f. heterophylla (3)



QUERCUS ALBA.

f. latiloba (1), f. sublyrata (2), f. repanda (3).

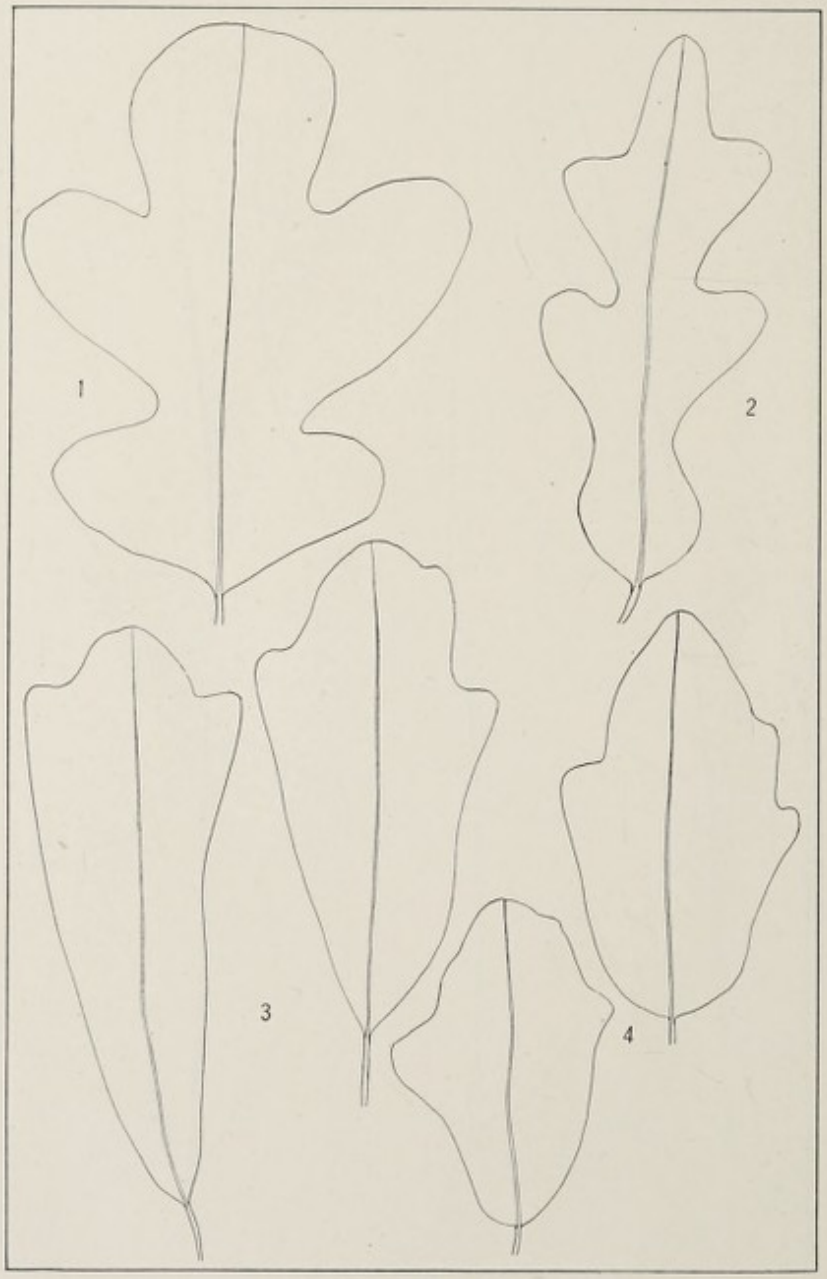


QUERCUS ALBA.

f. sublyrata (1), f. heterophylla (2).

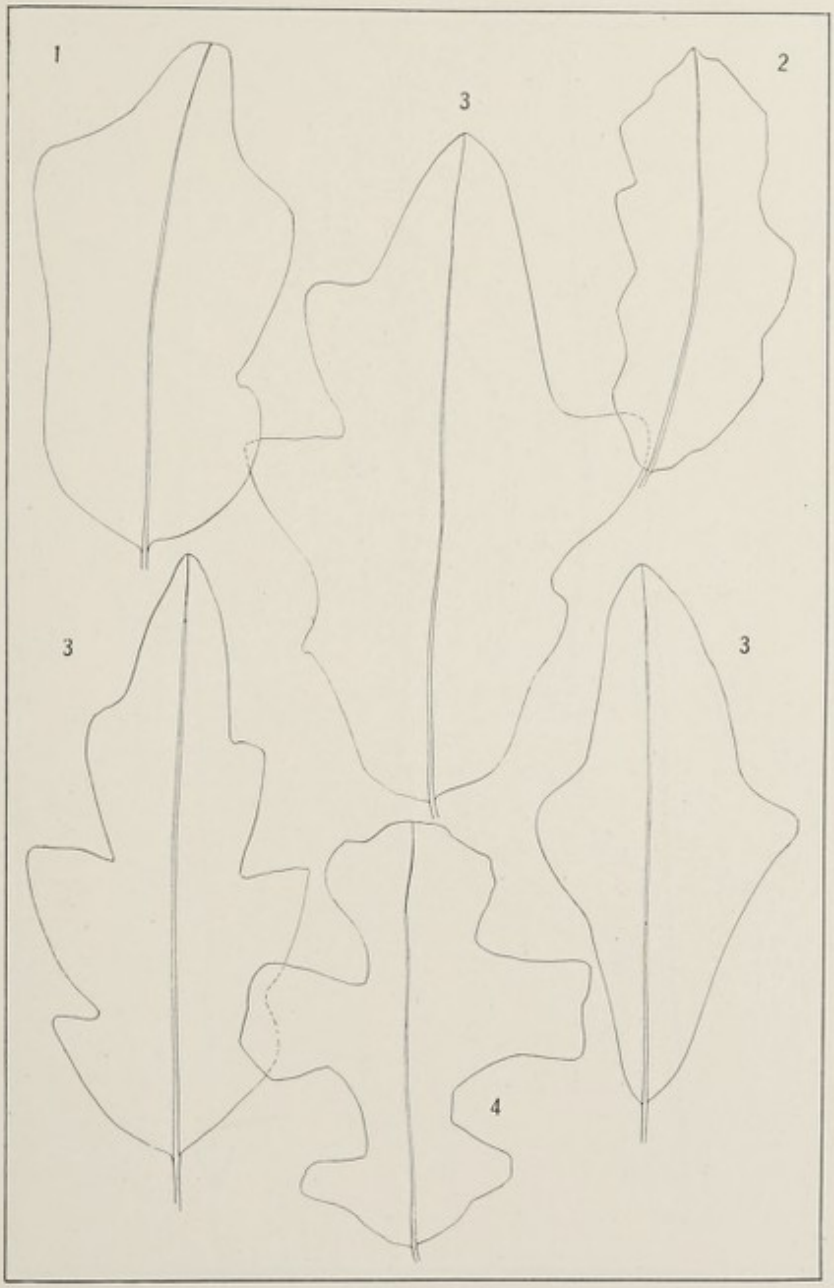


QUERCUS ALBA HETEROPHYLLA.



QUERCUS—THE STELLATAE.

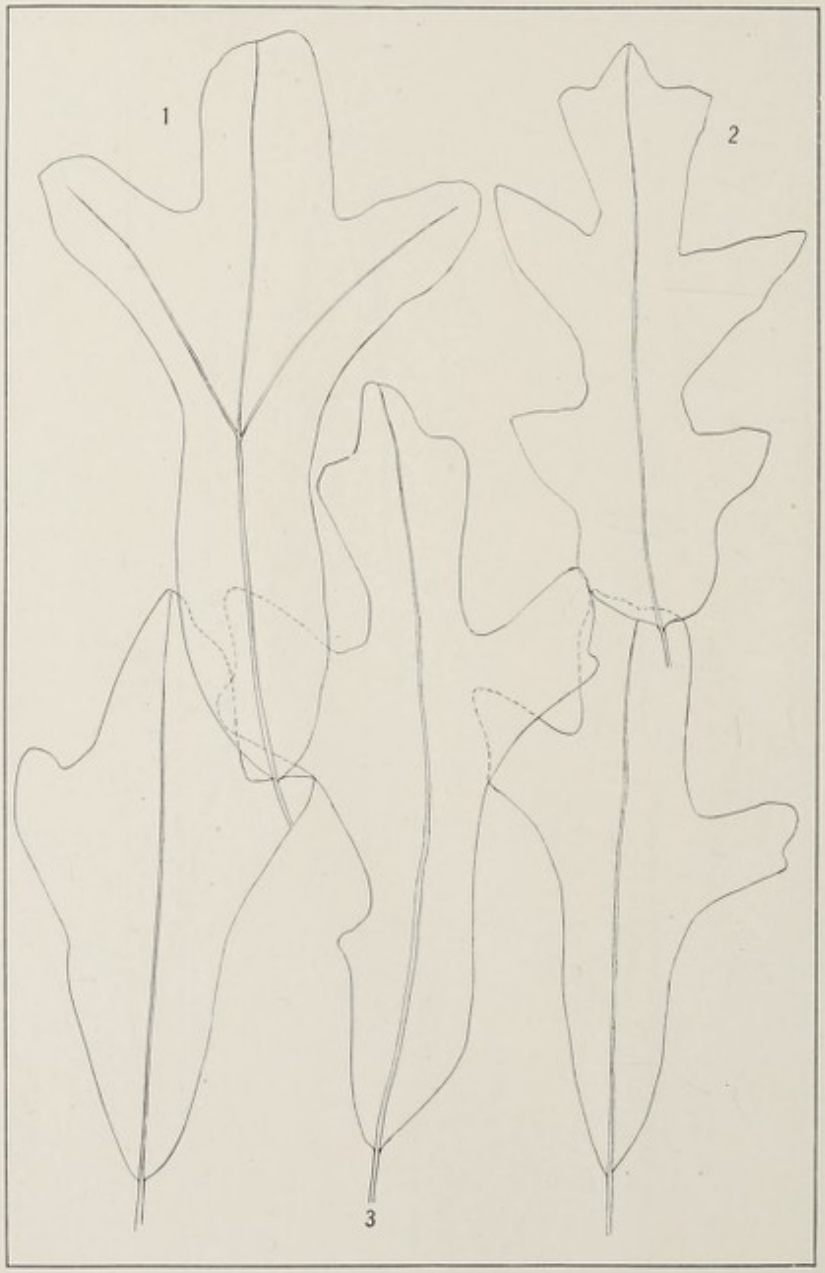
Q. Margaretta (1, 2), Q. Boyntoni (3), Q. Chapmani (4).



QUERCUS STELLATA.

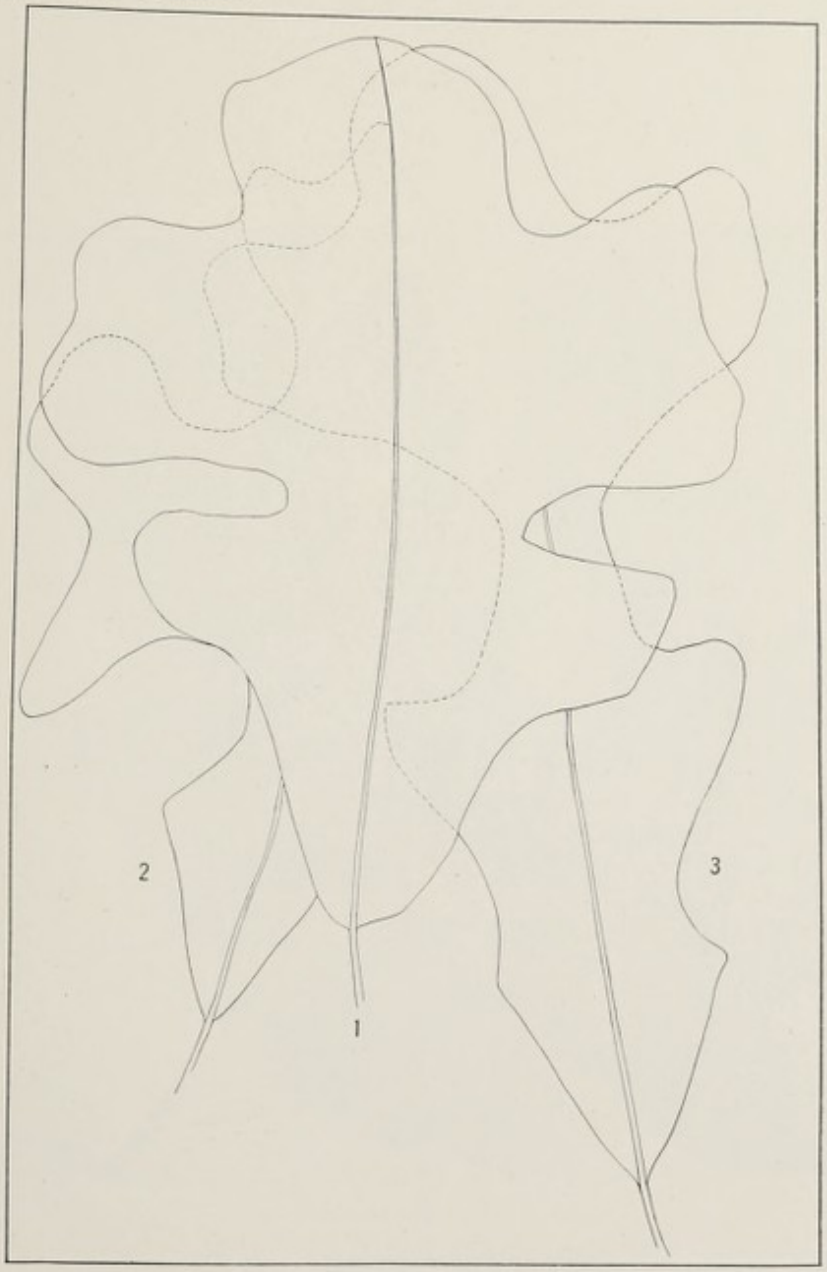
f. anomala (1), f. rufescens (2), f. parviloba (3), f. cruciformis (4).

27837—24——12



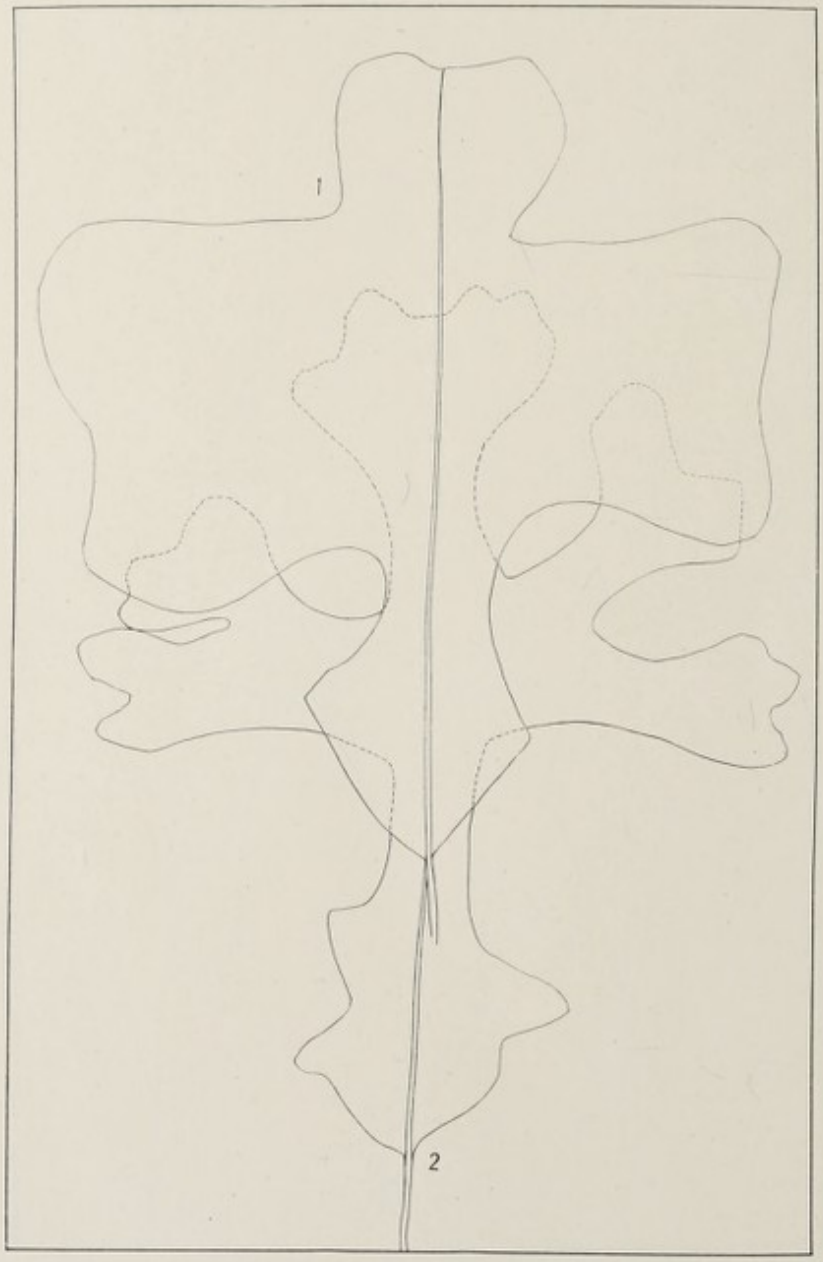
QUERCUS STELLATA.

f. attenuata (1), f. Palmeri (2), f. paludosa (3).



QUERCUS STELLATA.

Variants of f. typica (1, 2), f. oblonga (3).



QUERCUS STELLATA.

f. quadrata (1), f. Sterretti (2).

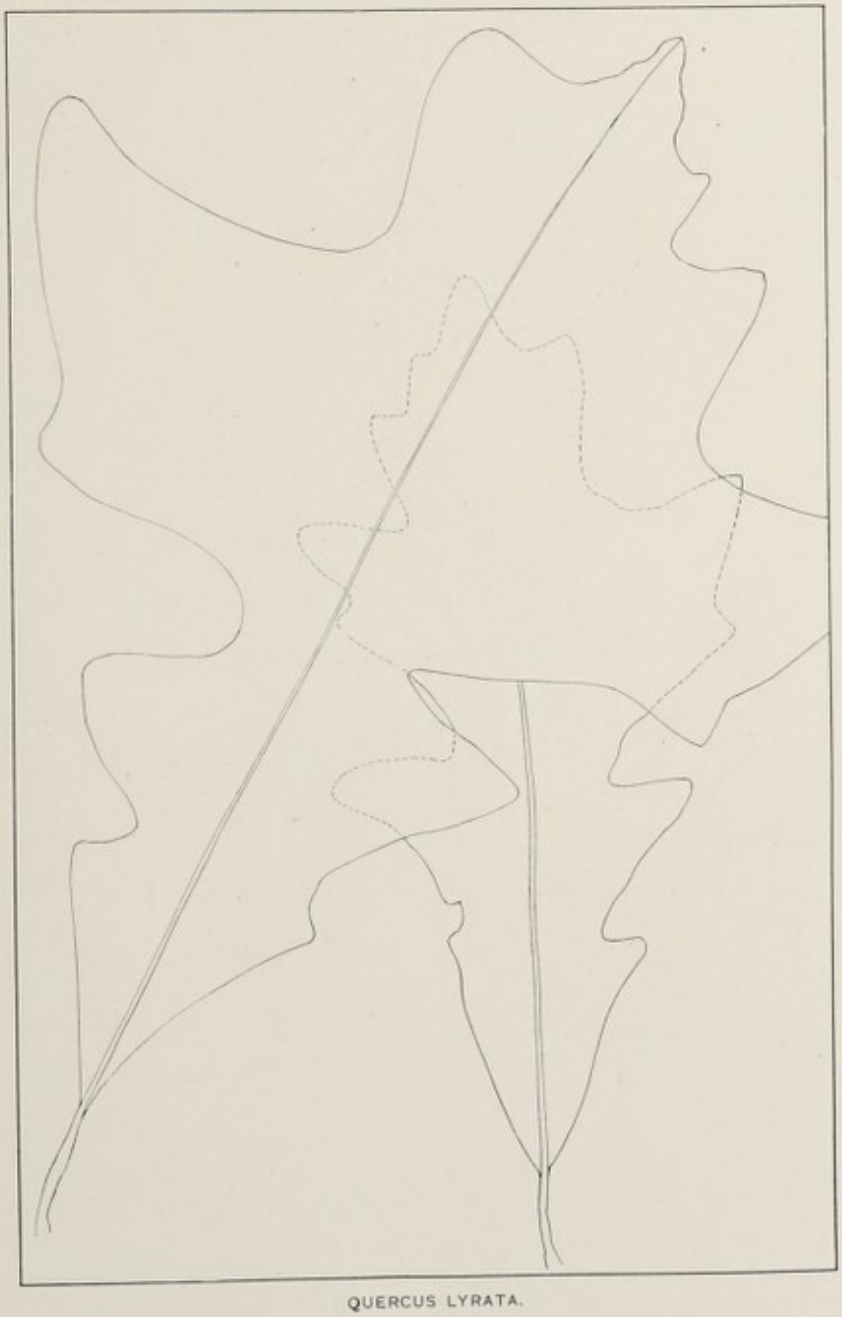


QUERCUS STELLATA.
(Q. Drummondii).

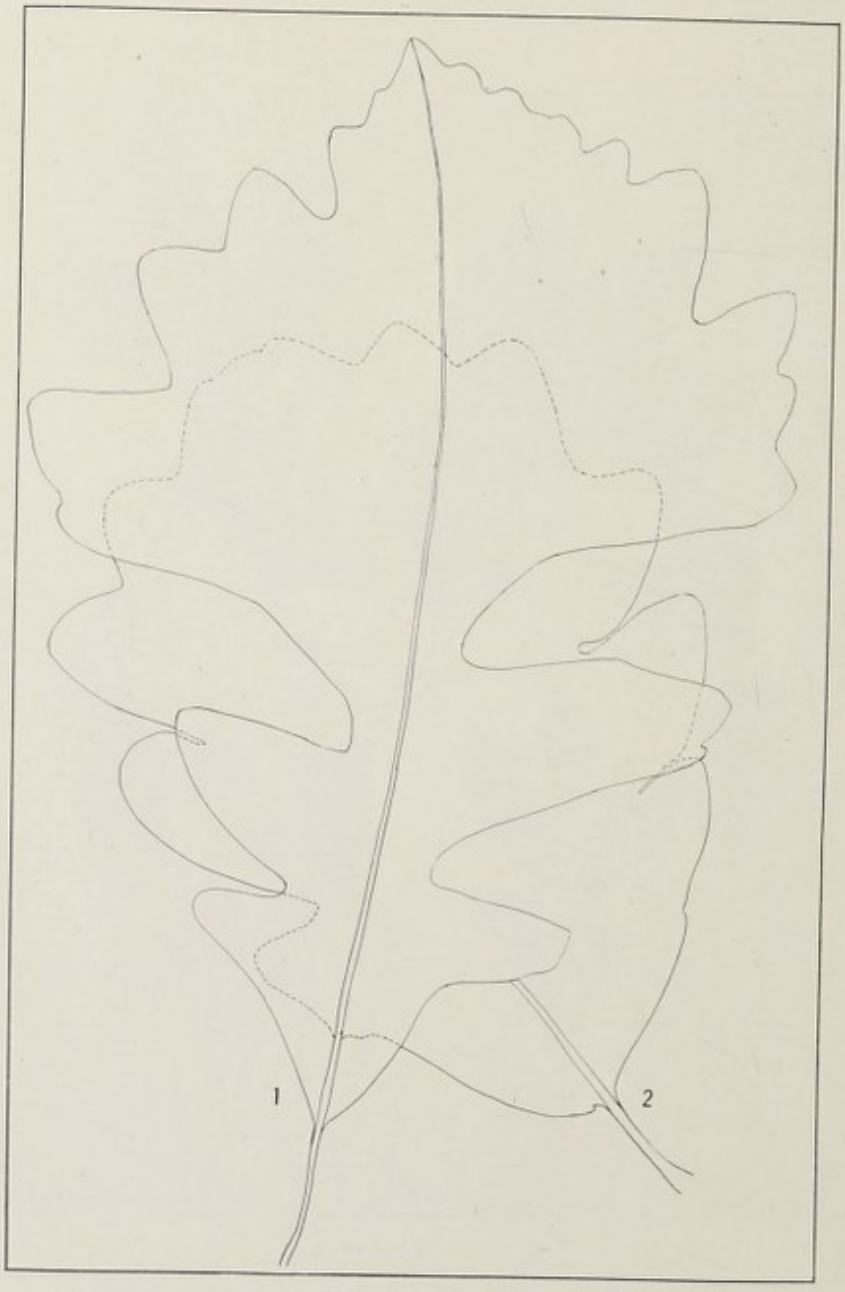


QUERCUS STELLATA.

(Q. floridana).

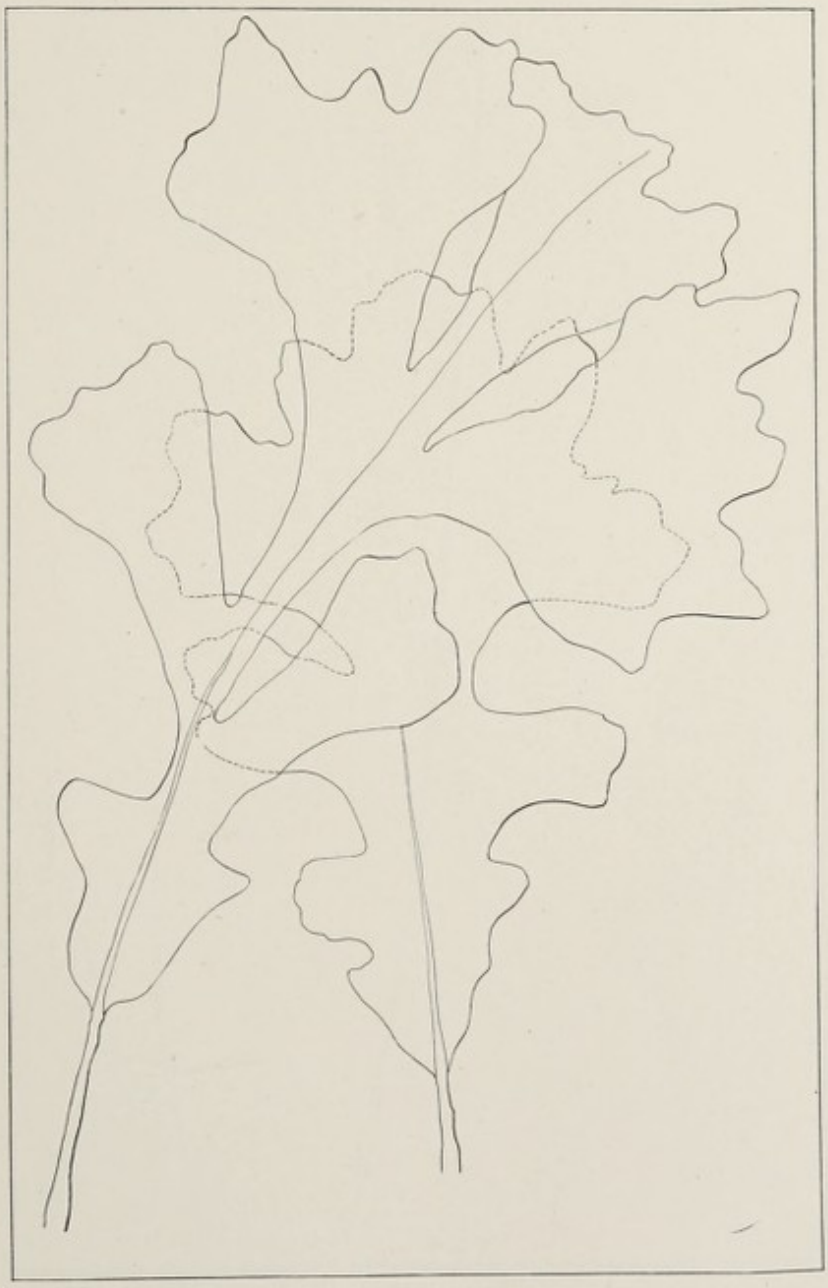


QUERCUS LYRATA.

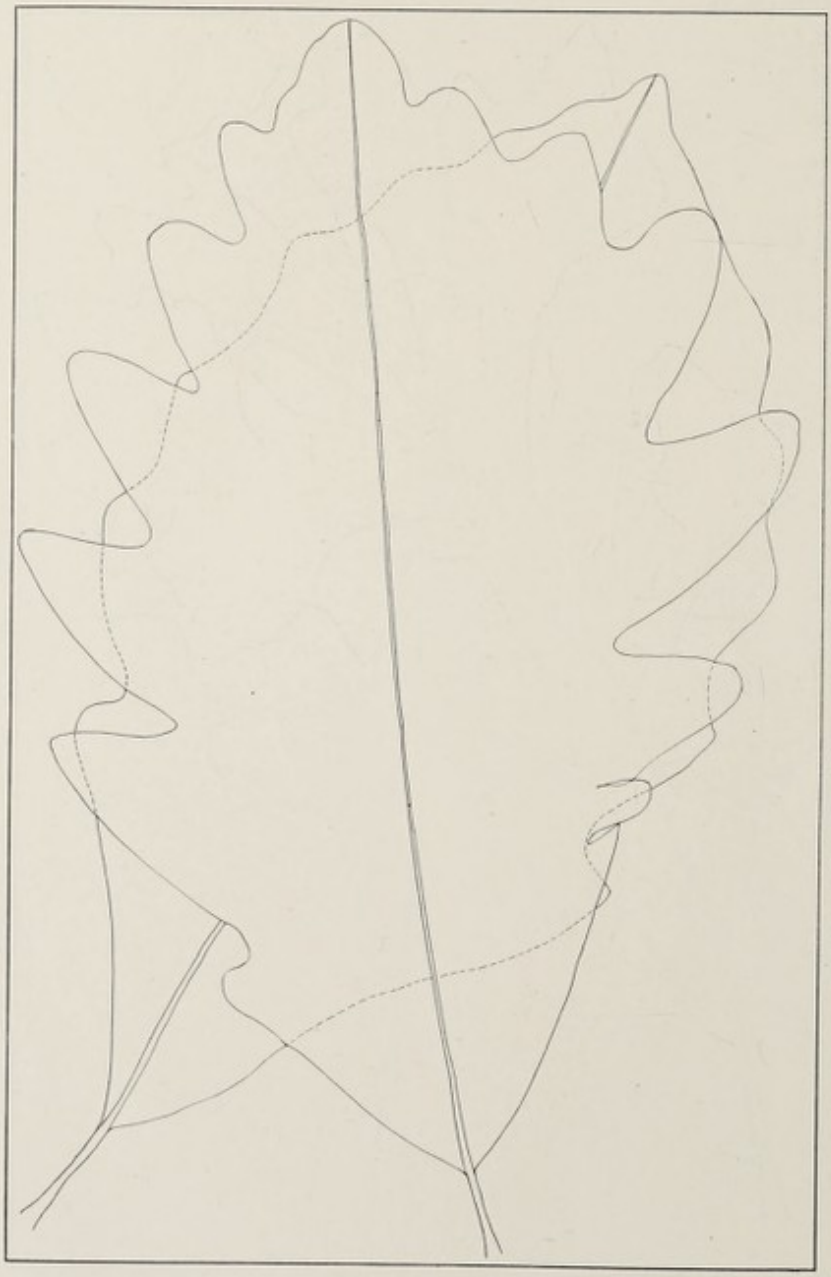


QUERCUS MACROCARPA.

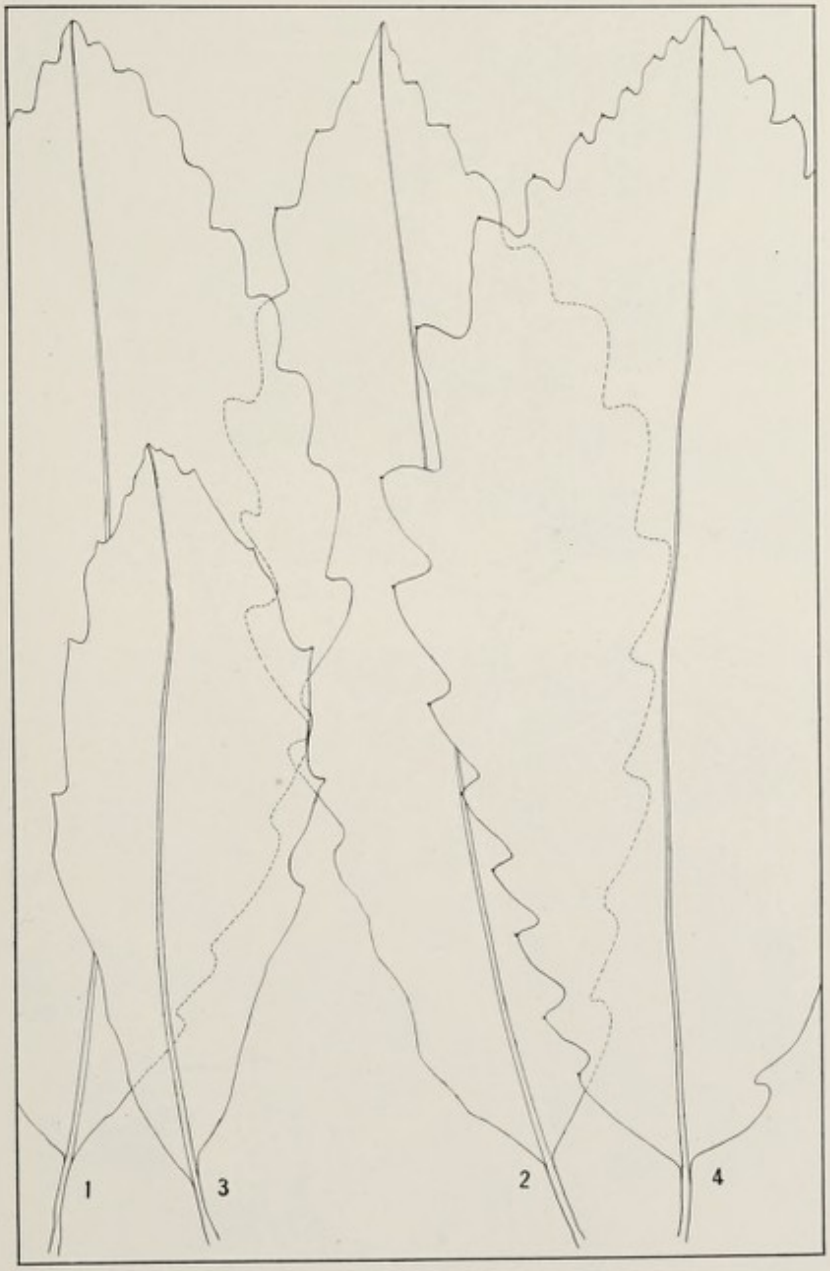
f. typica (1), f. orbiculata (2).



QUERCUS MACROCARPA.



QUERCUS BICOLOR.



QUERCUS—THE PRINOIDEAE.

Q. montana (1), Q. Muehlenbergii (2), Q. prinoides (3), Q. Prinus (4).



QUERCUS DOUGLASII (1), Q. SADLERIANA (2).



QUERCUS VIRGINIANA.



QUERCUS VIRGINIANA SAGRAEANA.



QUERCUS VIRGINIANA MACROPHYLLA.



QUERCUS VIRGINIANA VIRESCENS.





QUERCUS OLEOIDES.



QUERCUS OLEOIDES.



QUERCUS OLEOIDES AUSTRALIS.

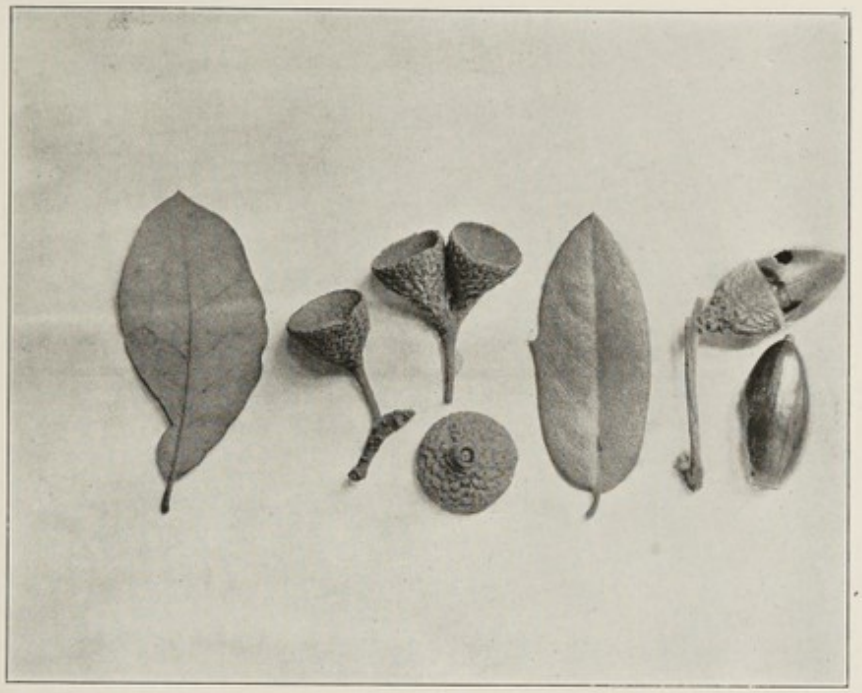


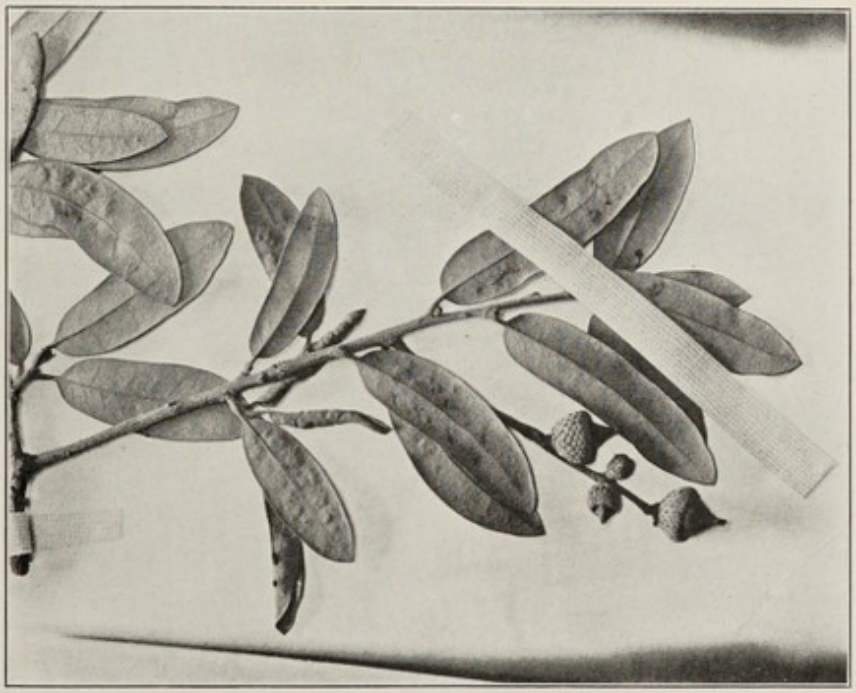
QUERCUS OLEOIDES AUSTRALIS.

27837—24——13



QUERCUS OLEOIDES LUTESCENS.





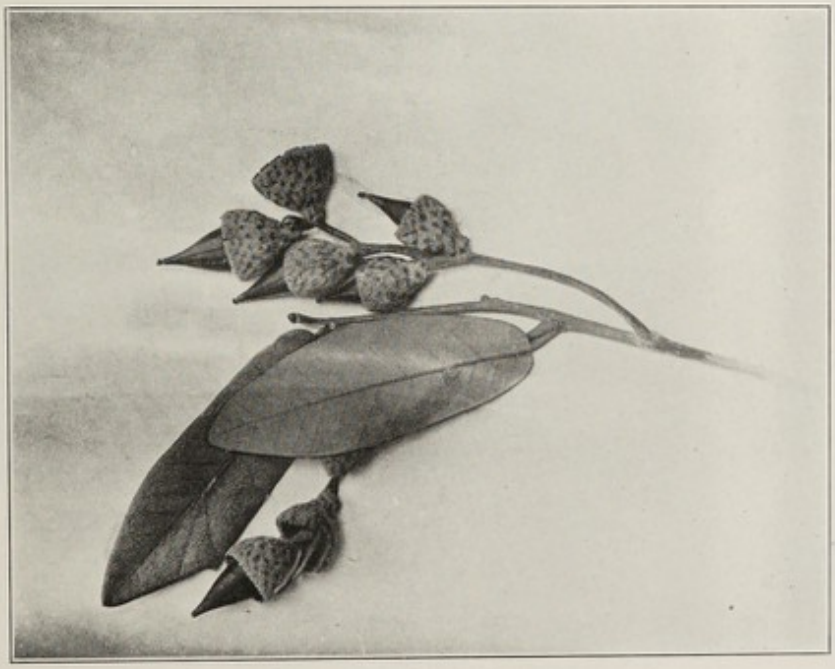
QUERCUS FUSIFORMIS.


UNITE
DEPOSITED BY



QUERCUS BRANDEGEI.





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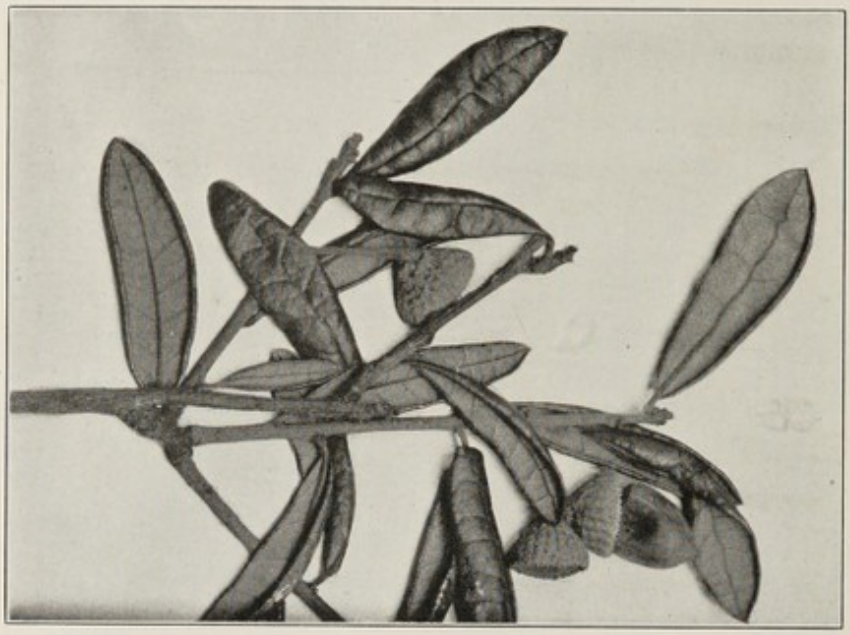
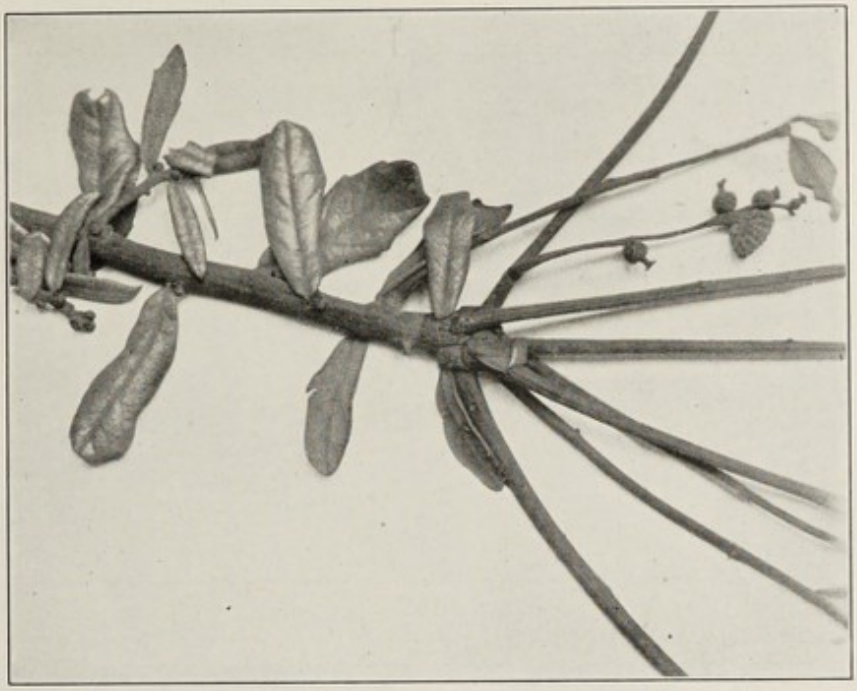


QUERCUS GEMINATA MARITIMA.

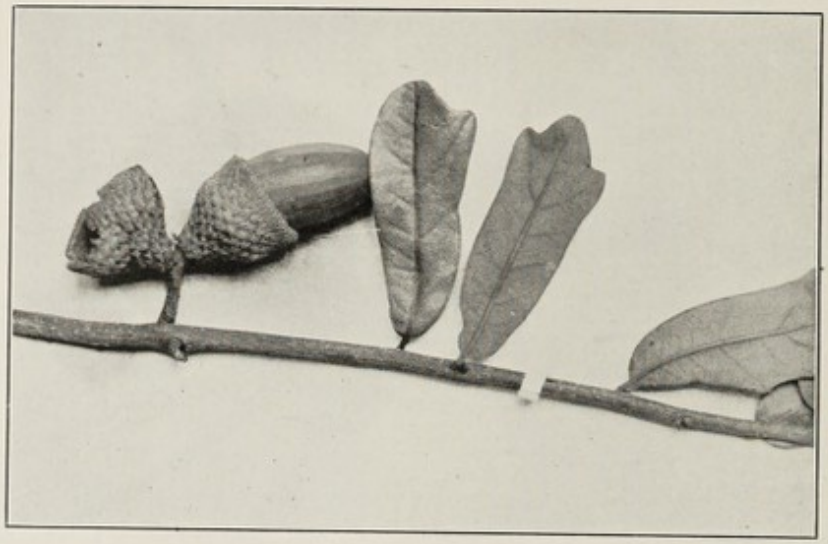


QUERCUS GEMINATA GRANDIFOLIA.





QUERCUS GEMINATA SUCCULENTA.



QUERCUS GEMINATA ROLFSII.



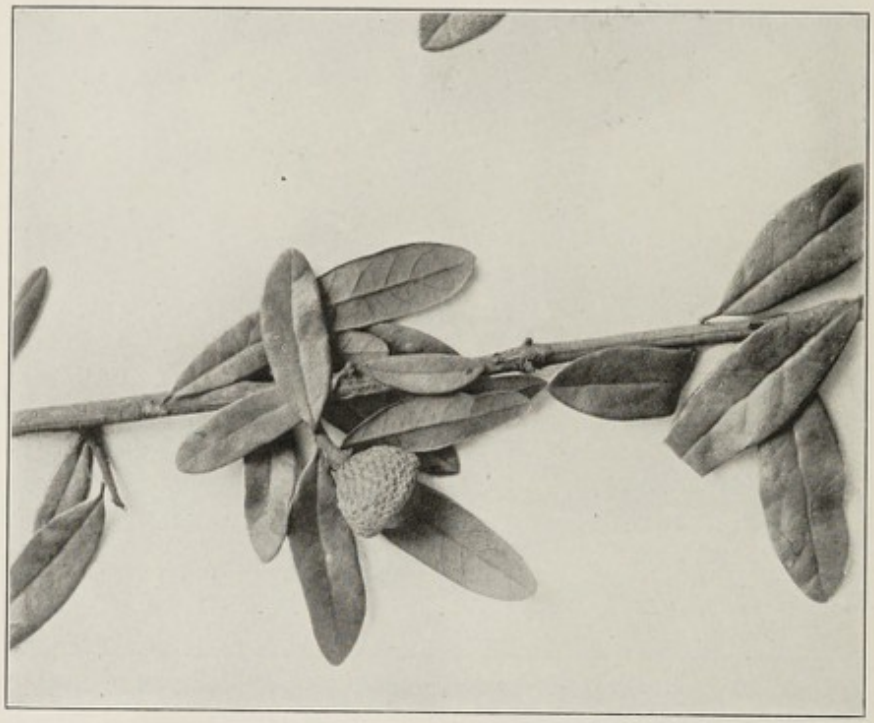
QUERCUS GEMINATA REASONERI.



QUERCUS MINIMA.



QUERCUS MINIMA PYGMAEA.



QUERCUS ANDROMEDA.



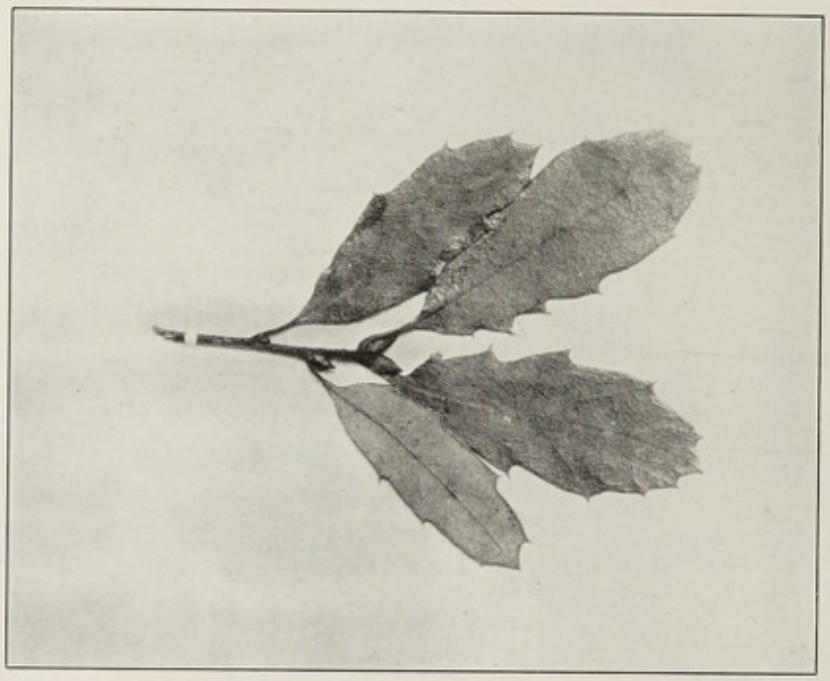
QUERCUS ANDROMEDA NANA.



QUERCUS DUMOSA MACDONALDI.



QUERCUS DUMOSA MICROCARPA.



QUERCUS DUMOSA ACUTIDENS.



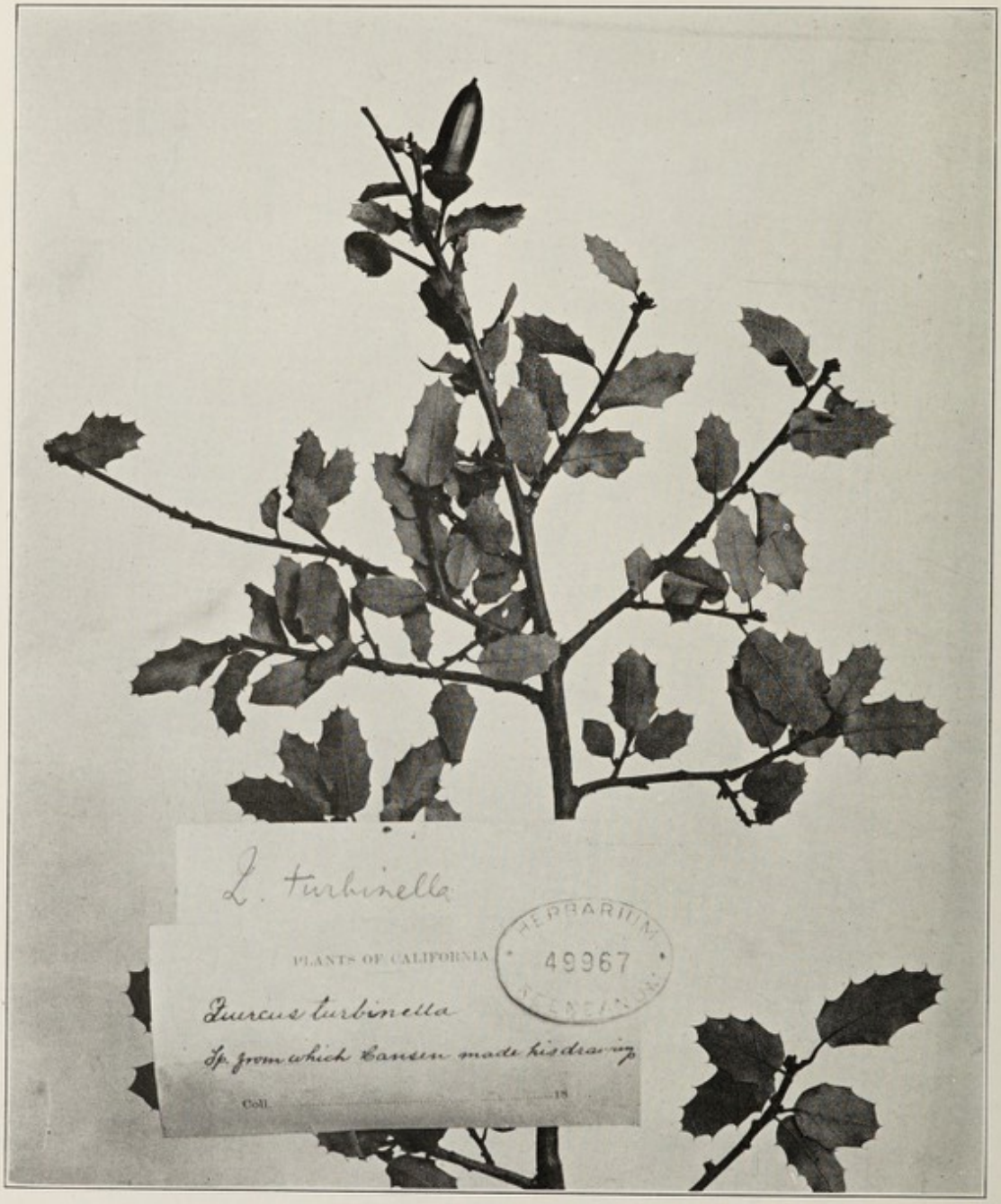
QUERCUS DUMOSA POPULIFOLIA.



QUERCUS DUMOSA DIVERSIFOLIA.



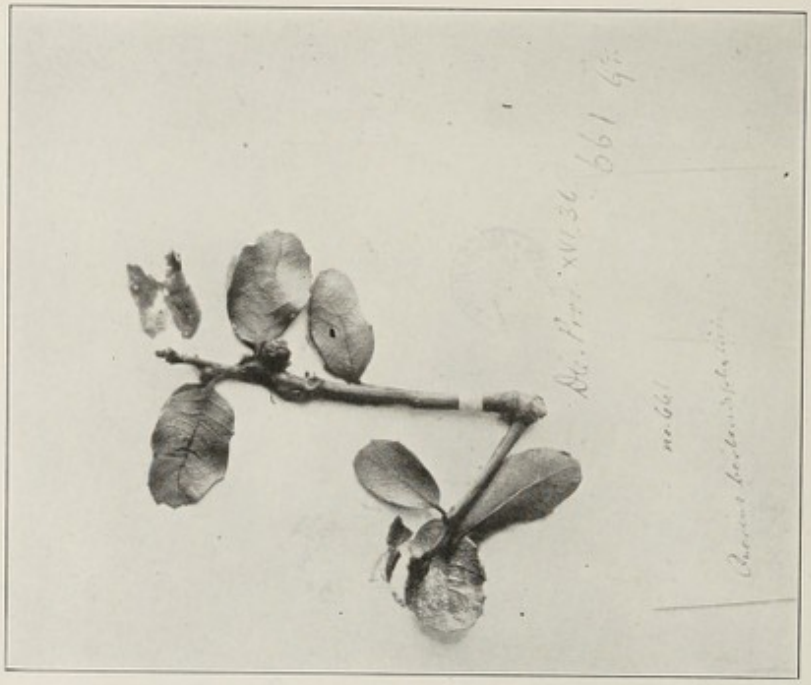
QUERCUS DUMOSA LINEARIS.



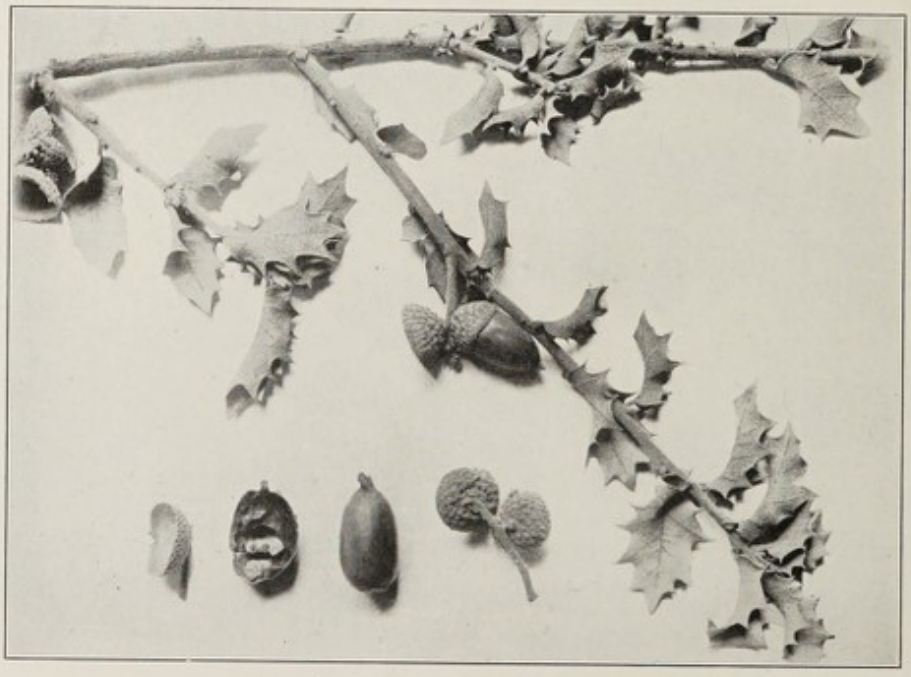
QUERCUS DUMOSA TURBINELLA.



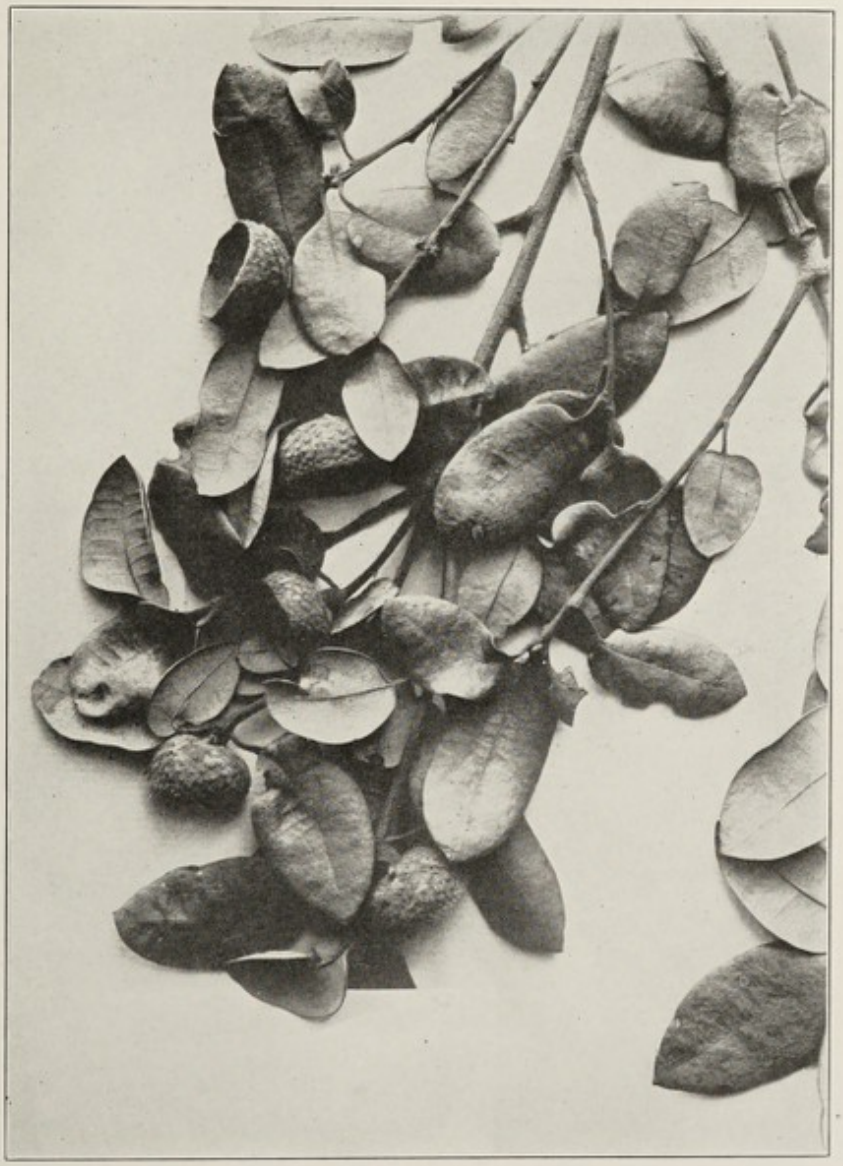
QUERCUS DUMOSA BERBERIDIFOLIA.



QUERCUS DUMOSA BERBERIDIFOLIA.

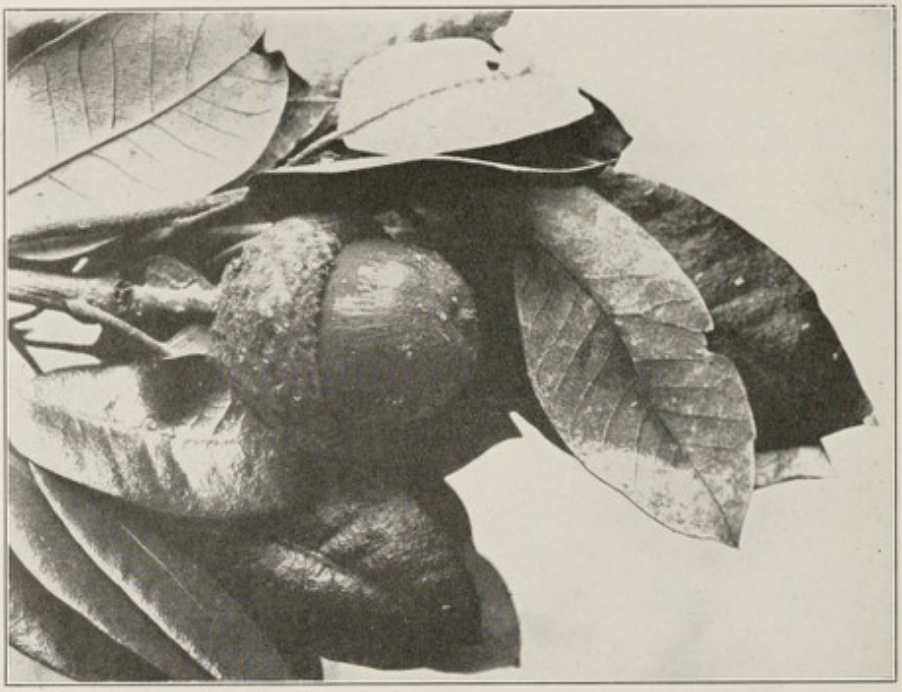


QUERCUS DUMOSA CRISPATA.



QUERCUS CHRYSOLEPIS.

27837—24——14



QUERCUS CHRYSOLEPIS.



QUERCUS VACCINIFOLIA.



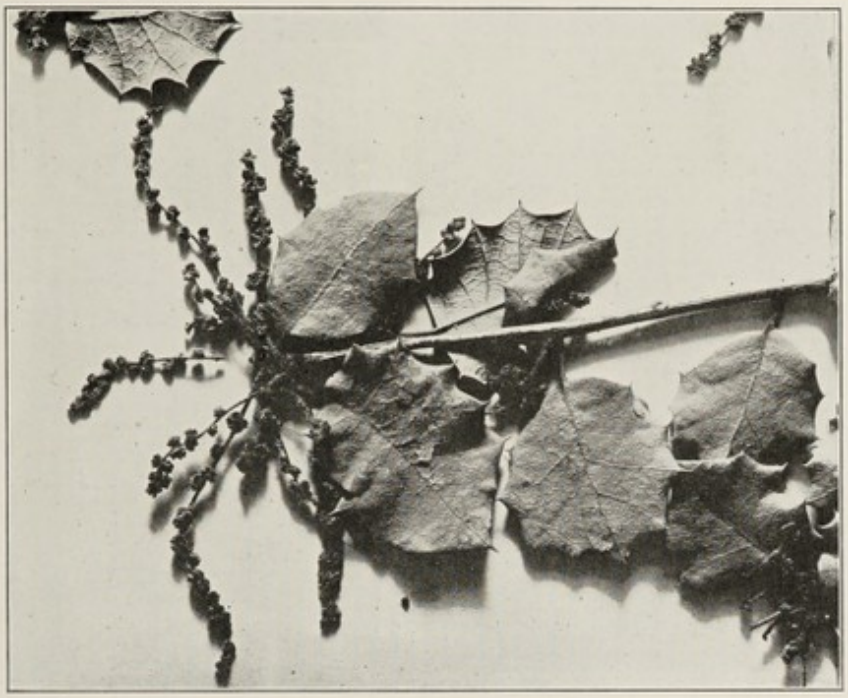


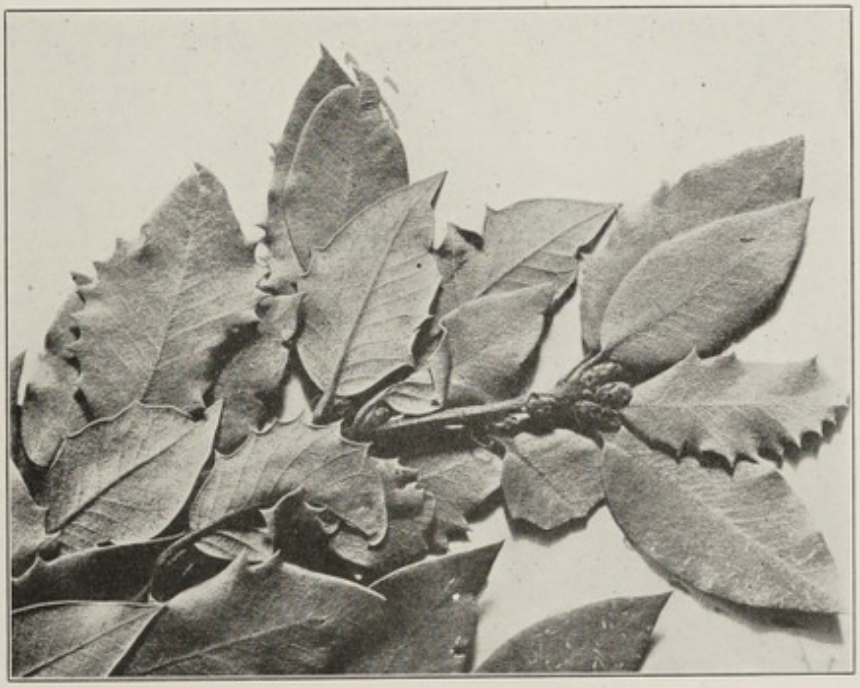
QUERCUS TOMENTELLA.



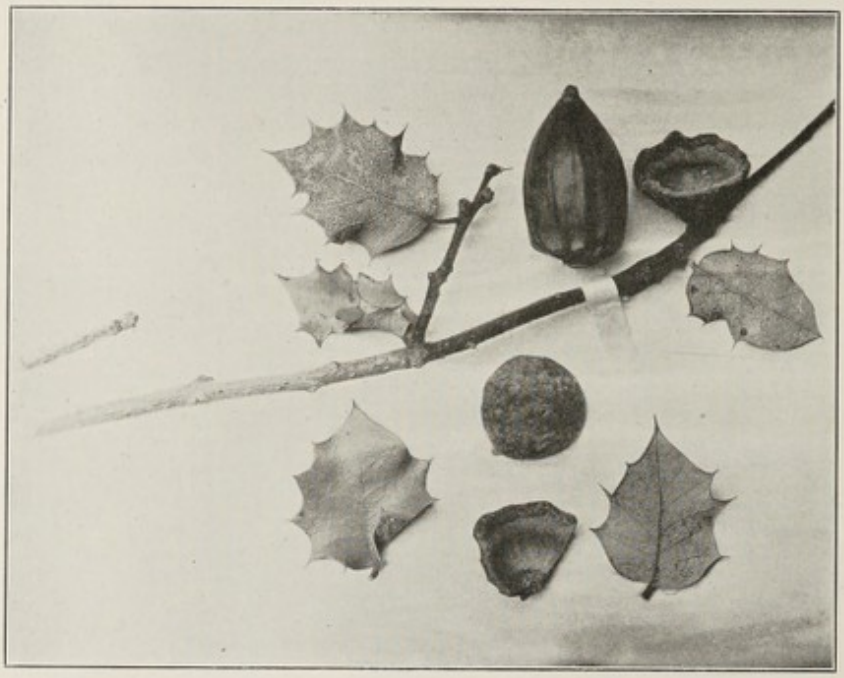


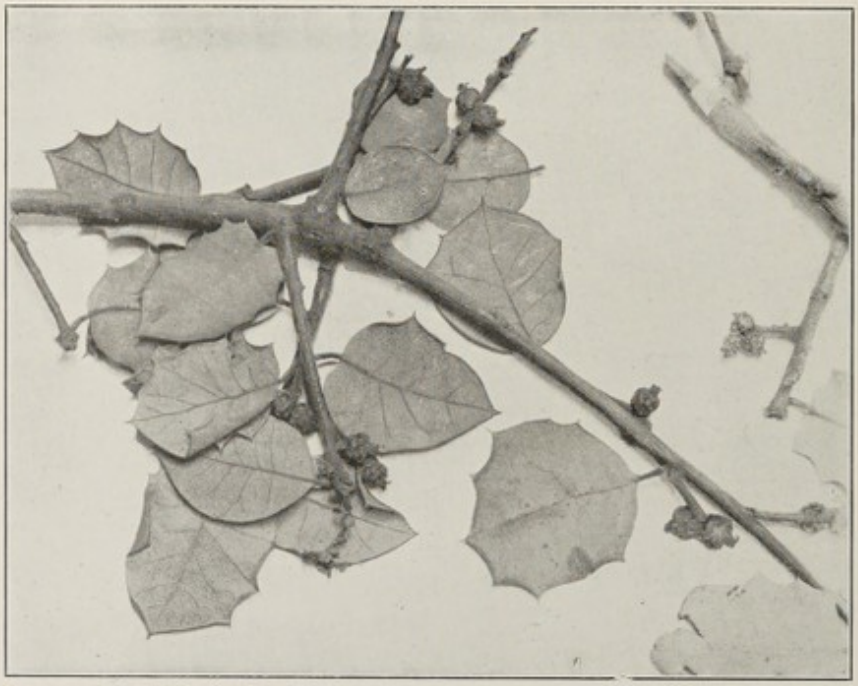
QUERCUS TOMENTELLA.





QUERCUS PALMERI.



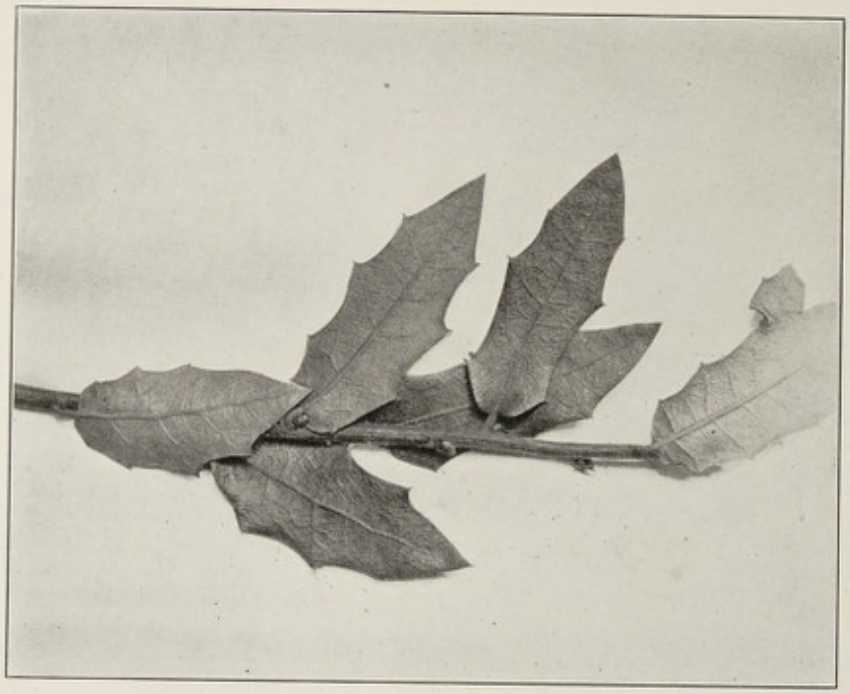


QUERCUS PALMERI.





QUERCUS WILCOXII.

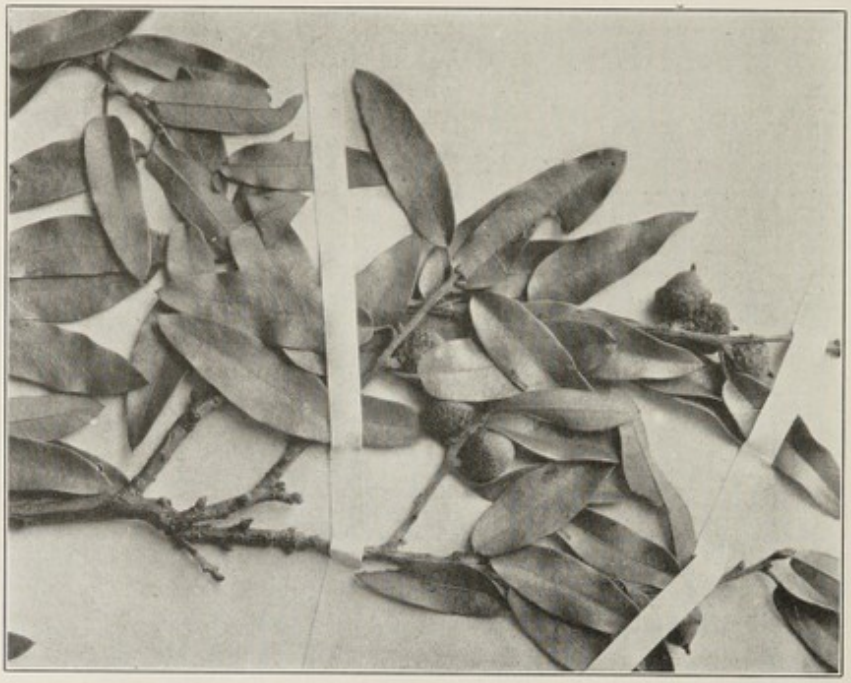




QUERCUS EMORYI.



QUERCUS EMORYI.



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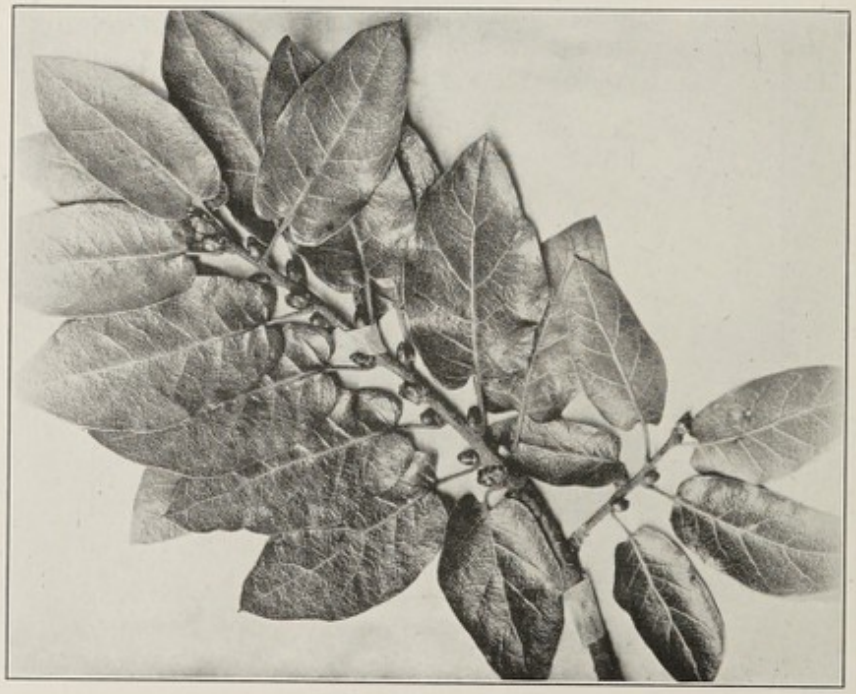


QUERCUS NITIDISSIMA.



QUERCUS EDUARDI.



QUERCUS EDUARDI CESPITIFERA.



QUERCUS BALSEQUILLANA.



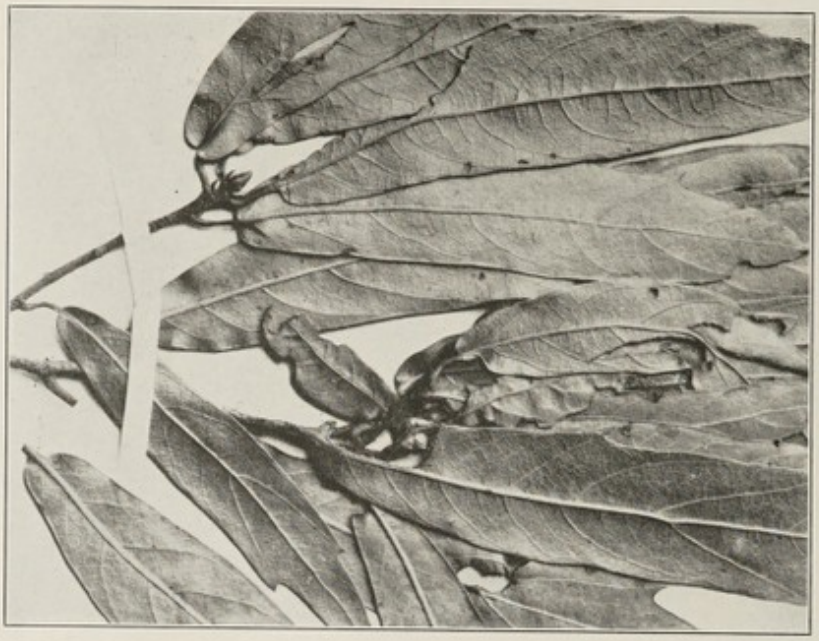
QUERCUS DURAZNILLO.



QUERCUS DURAZNILLO BULLATA.



QUERCUS DURAZNILLO PINETORUM.





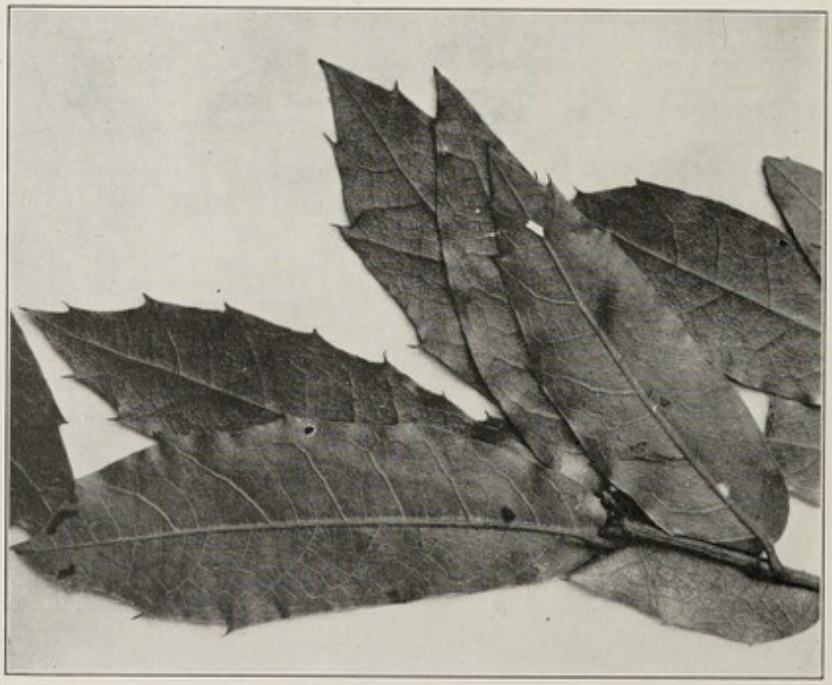
QUERCUS VIMINEA.



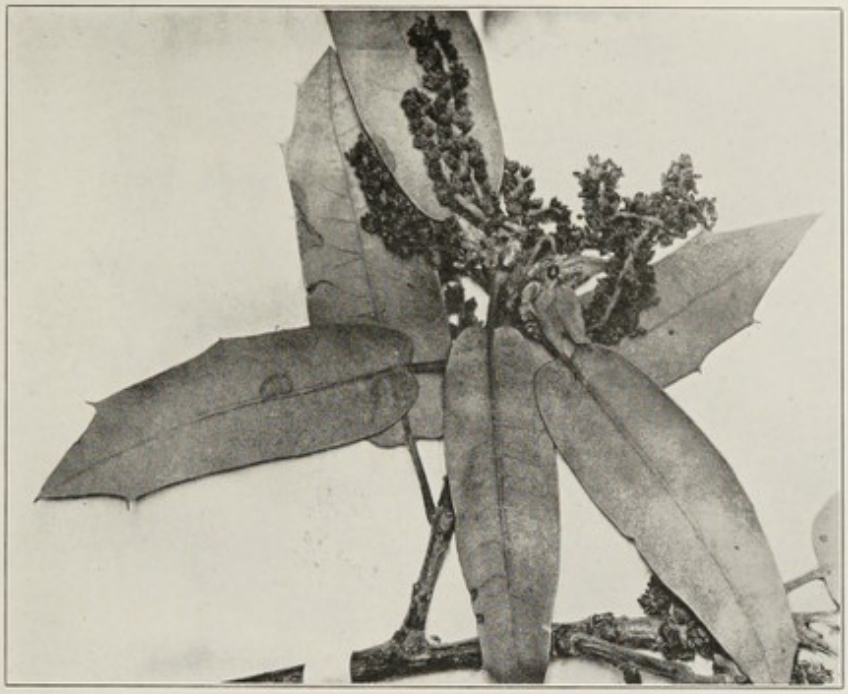


QUERCUS BOLANYOSENSIS.





QUERCUS DEVIA.





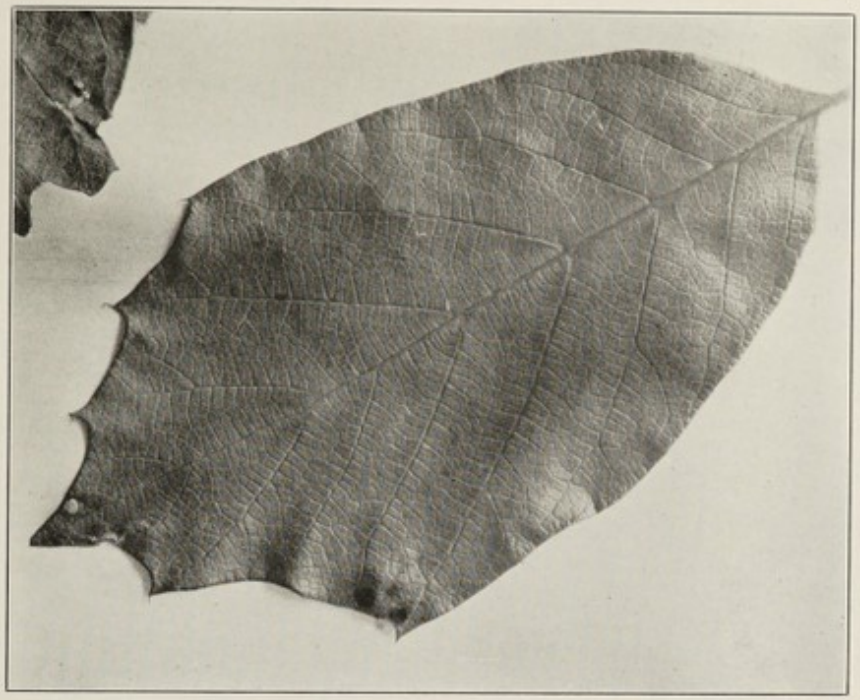
QUERCUS PENINSULARIS.

27837—24——15





QUERCUS HYPOLEUCA.





QUERCUS SCYTOPHYLLA.



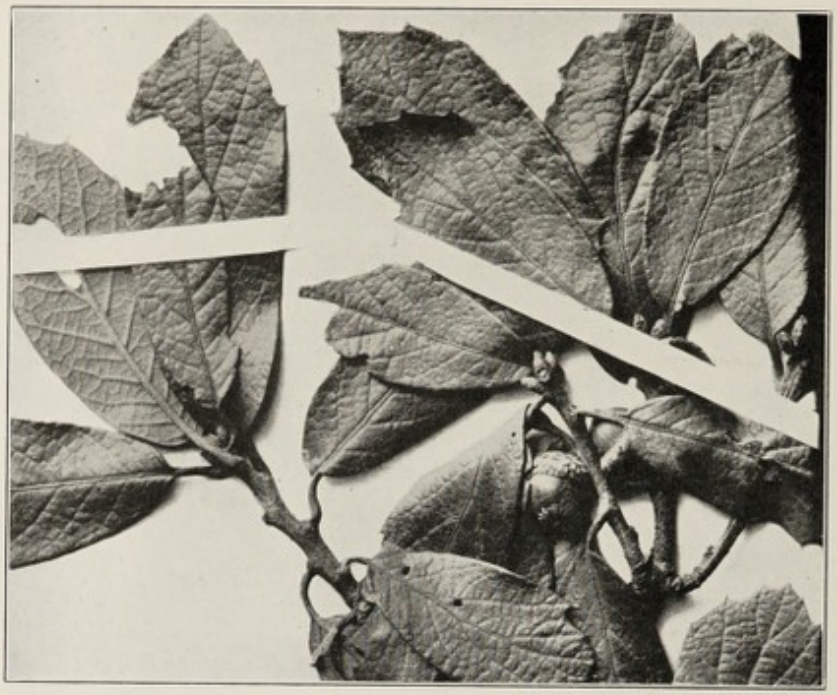
QUERCUS CAMPANARIENSIS.



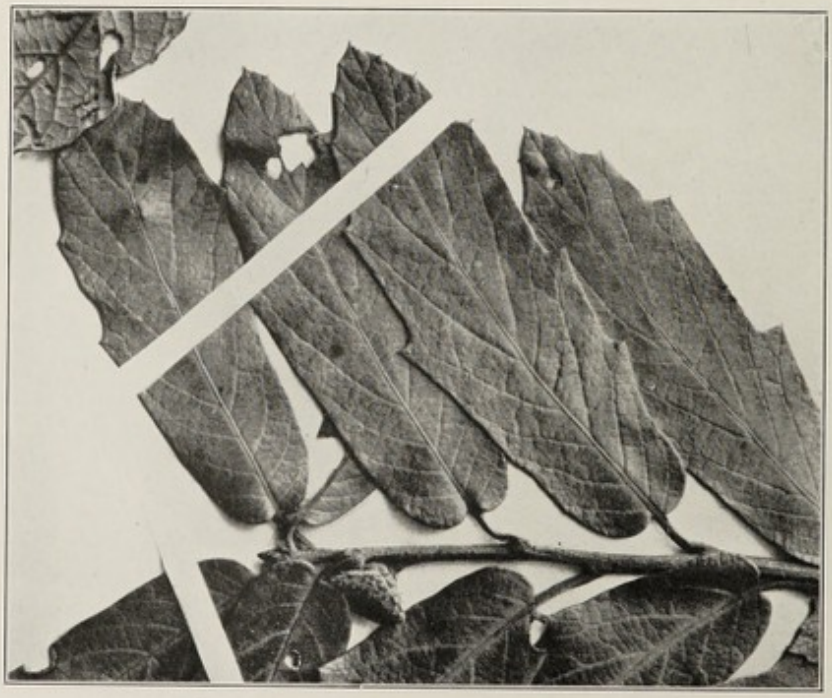
QUERCUS EPILEUCA.



QUERCUS INCARNATA AMPLA.



QUERCUS INCARNATA.



QUERCUS INCARNATA LONGA.



QUERCUS INCARNATA GROSSE-SERRATA.



QUERCUS OMISSA.



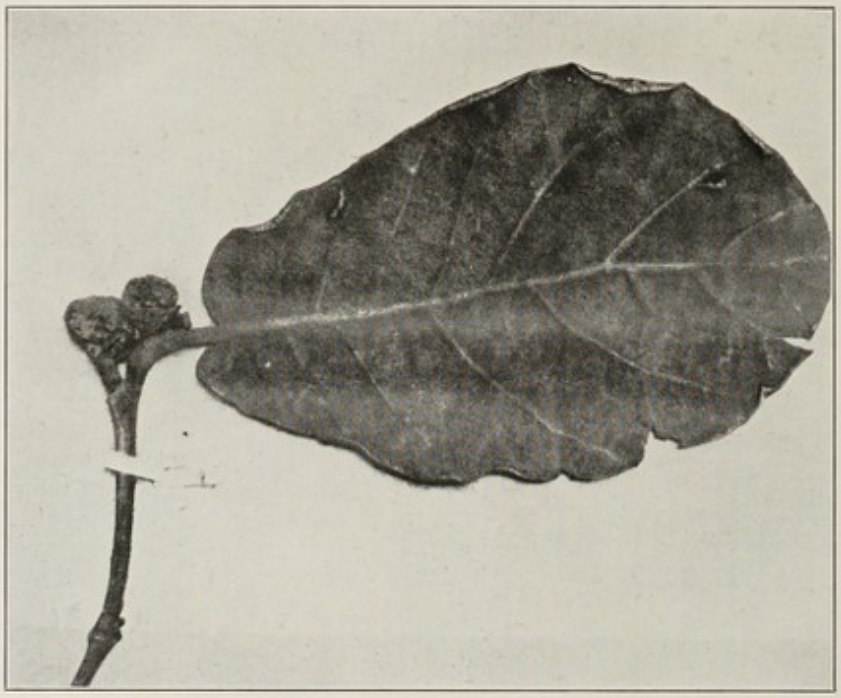


QUERCUS FLOCCOSA.



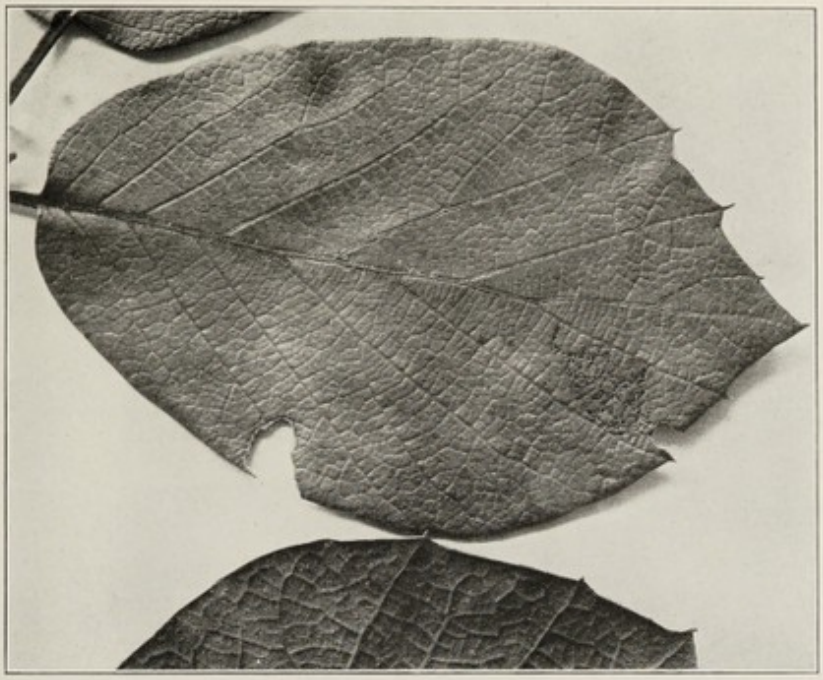


QUERCUS ORIZABAE.



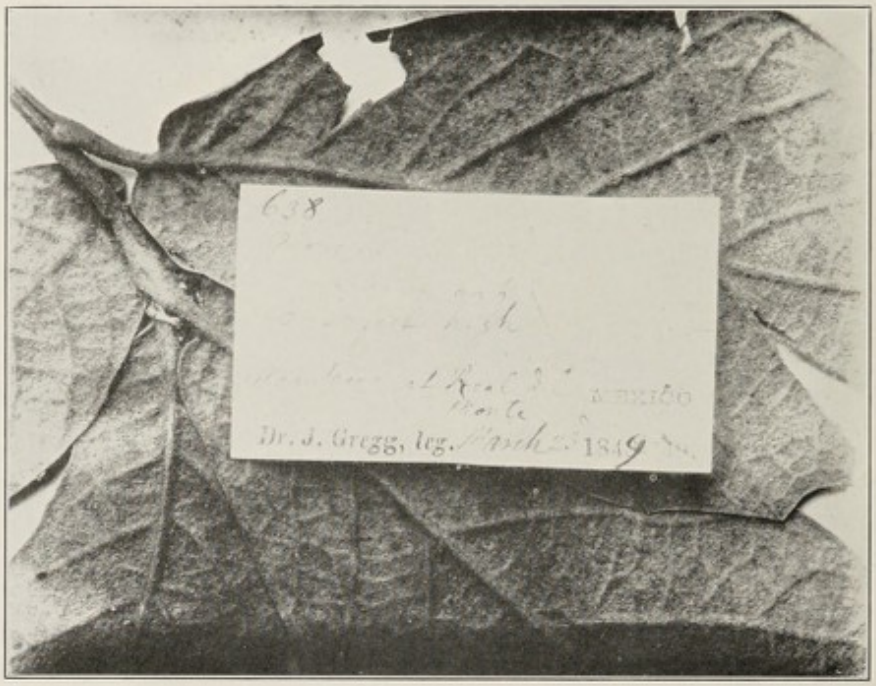


QUERCUS CRASSIFOLIA.





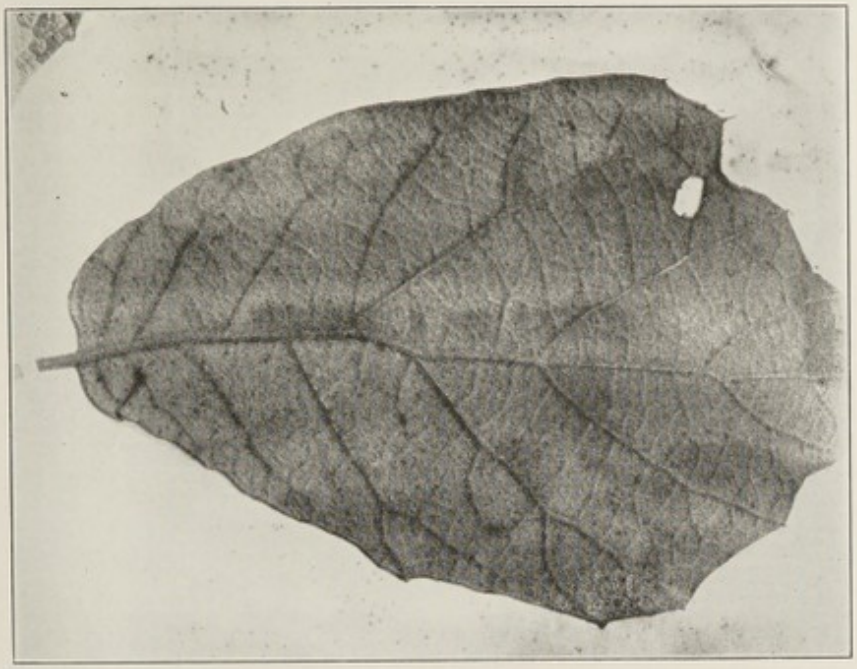
QUERCUS FULVA.

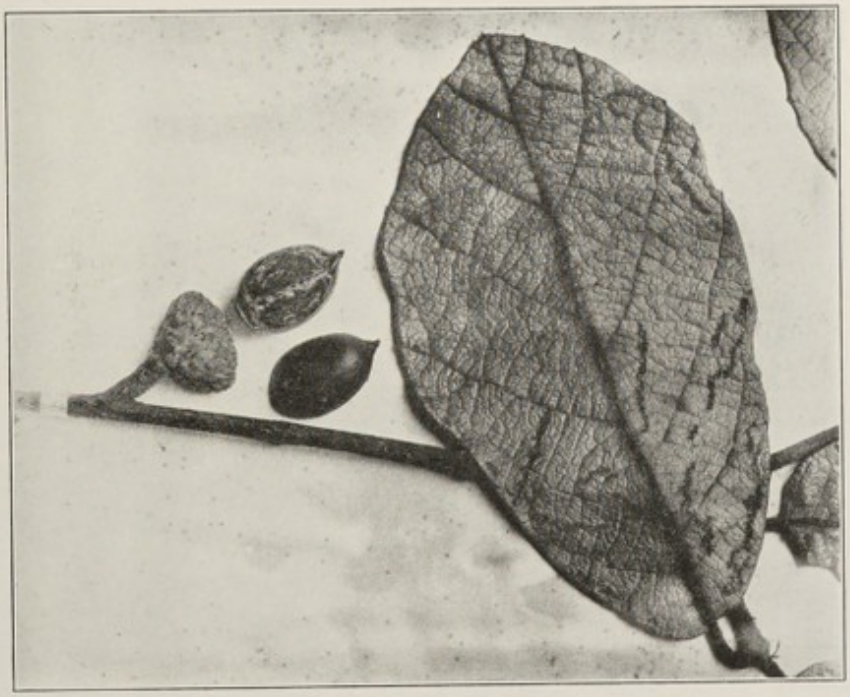


QUERCUS CRASSIFOLIA.



QUERCUS FULVA.



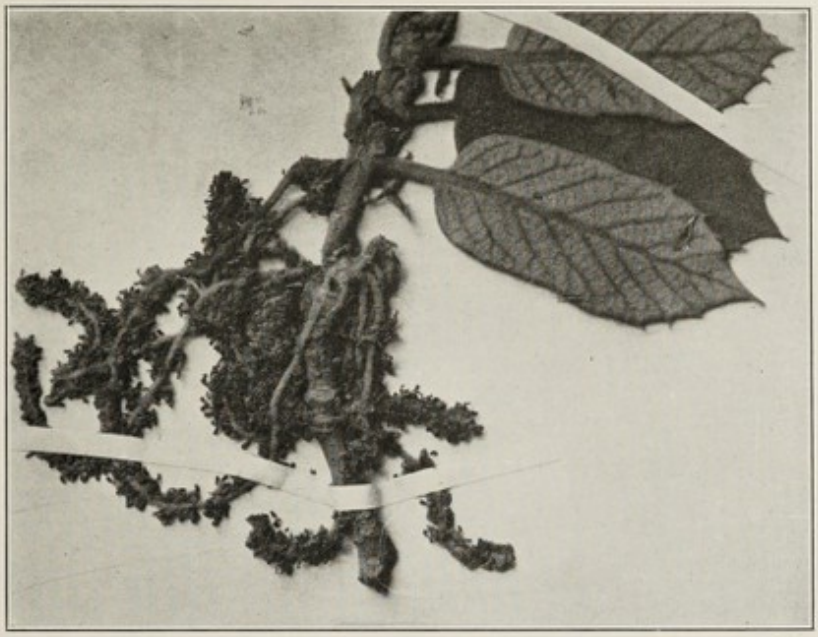


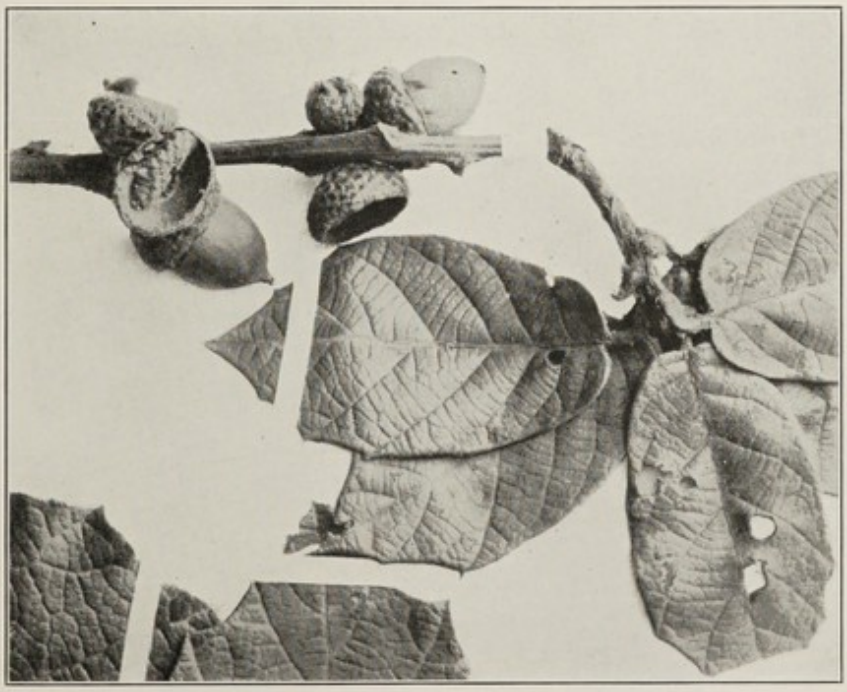
QUERCUS FELIPENSIS.





QUERCUS BRACHYSTACHYS.





QUERCUS BRACHYSTACHYS.



QUERCUS BRACHYSTACHYS VENULOSA.



QUERCUS BRACHYSTACHYS CAERULEA.



QUERCUS MORELIANA.

27837—24——16



QUERCUS STIPULARIS.





QUERCUS STIPULARIS.





QUERCUS STIPULARIS.



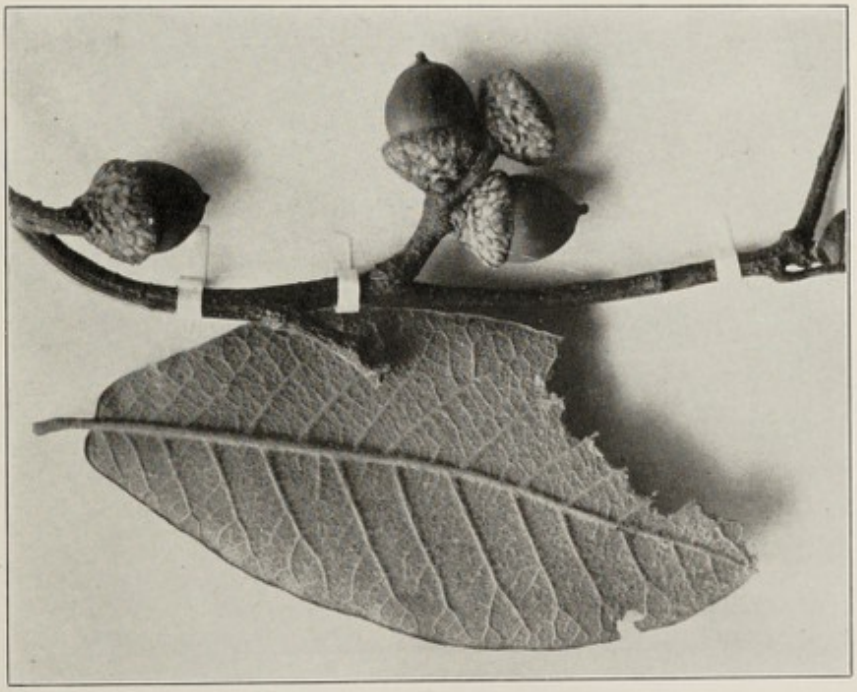


QUERCUS ERRANS.

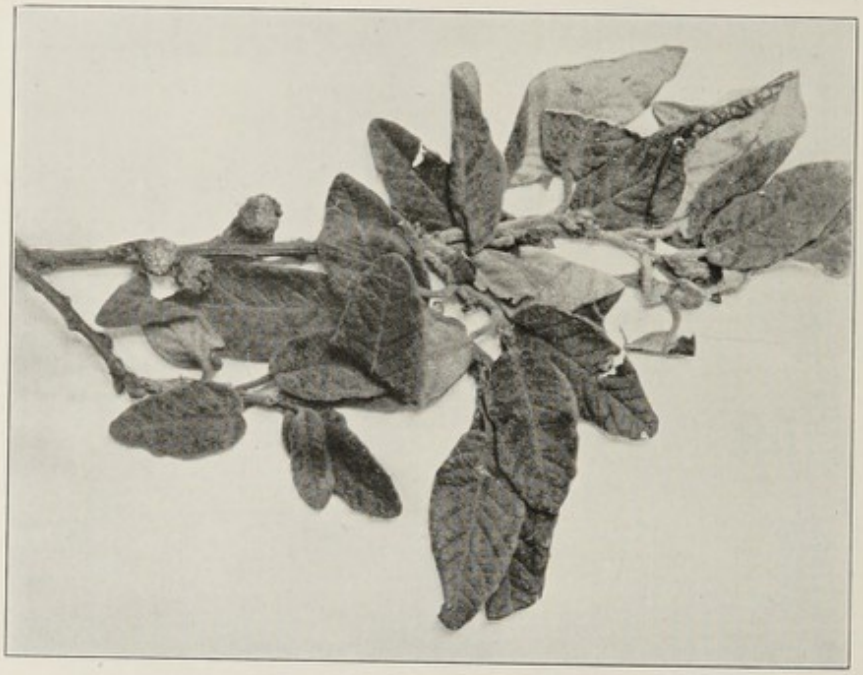


QUERCUS CHICAMOLENSIS.



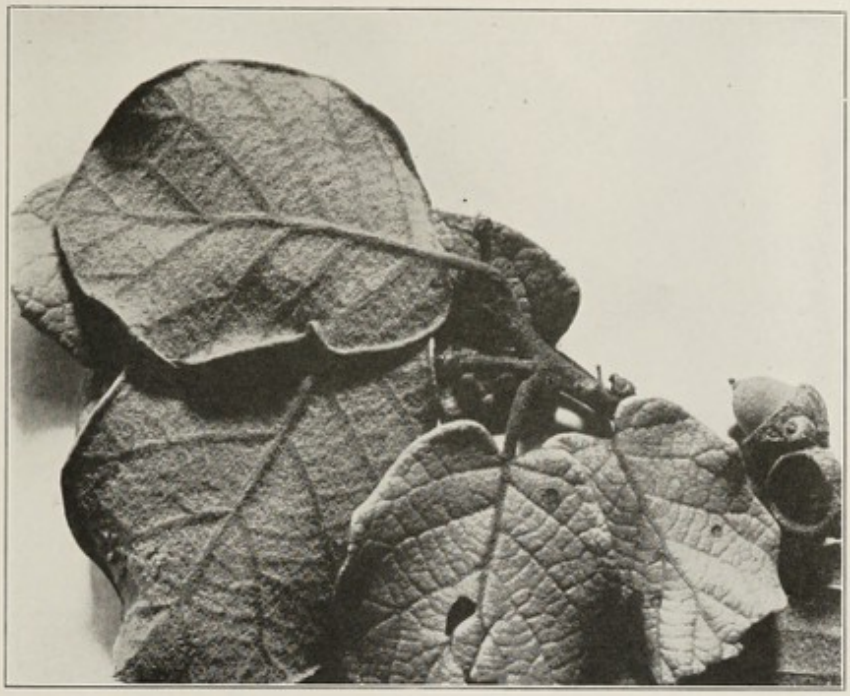


QUERCUS HAHNII.





QUERCUS ESPERANZAE.



QUERCUS ORBICULATA.



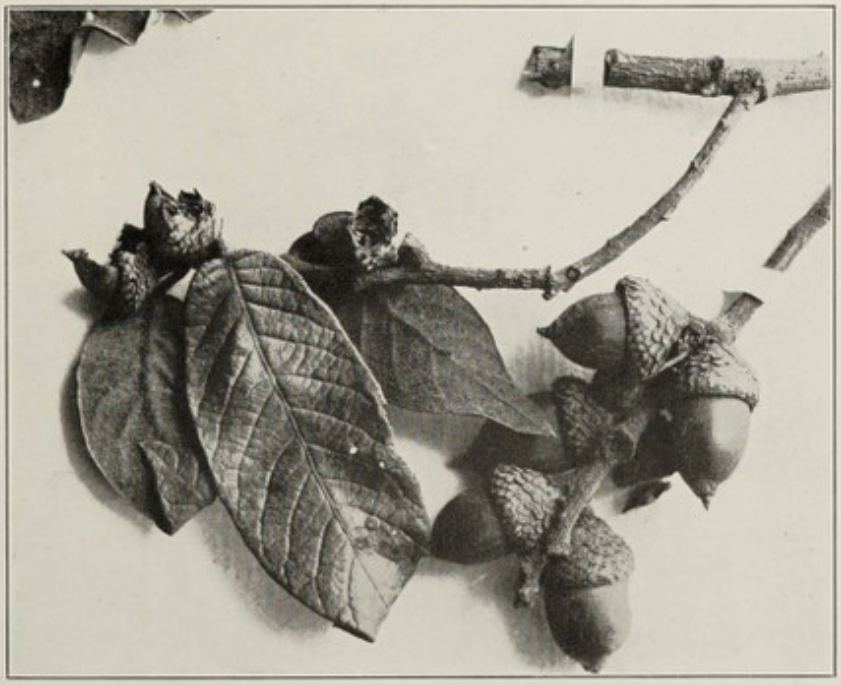
QUERCUS MIGUELITENSIS.





QUERCUS DYSOPHYLLA.





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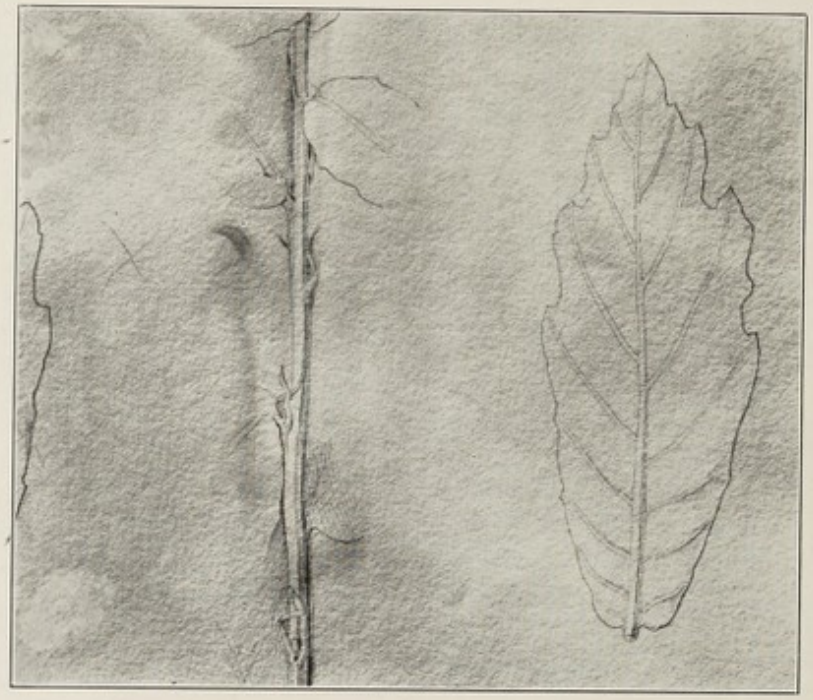
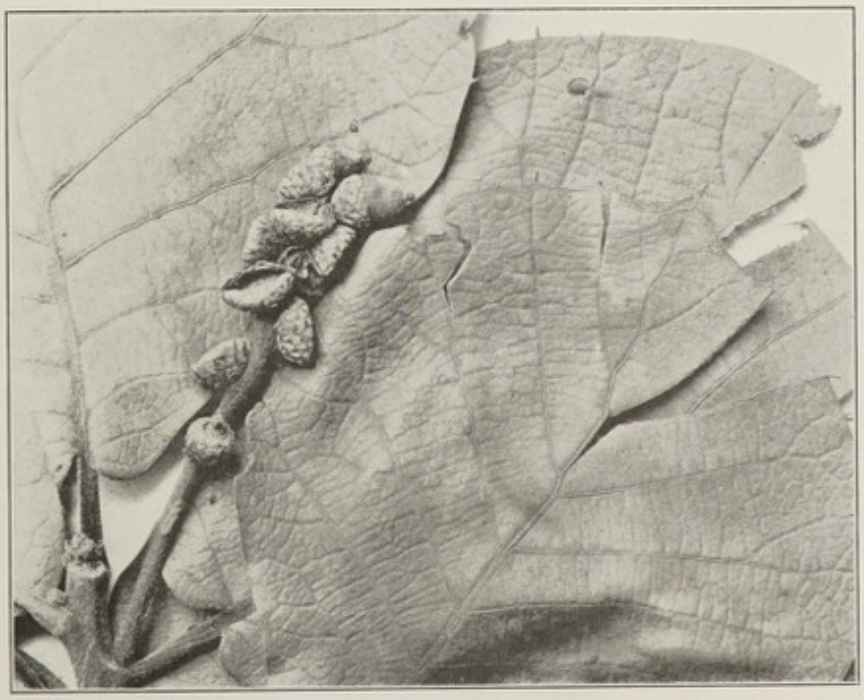




QUERCUS SPLENDENS.



QUERCUS URBANI.



QUERCUS RADIATA.



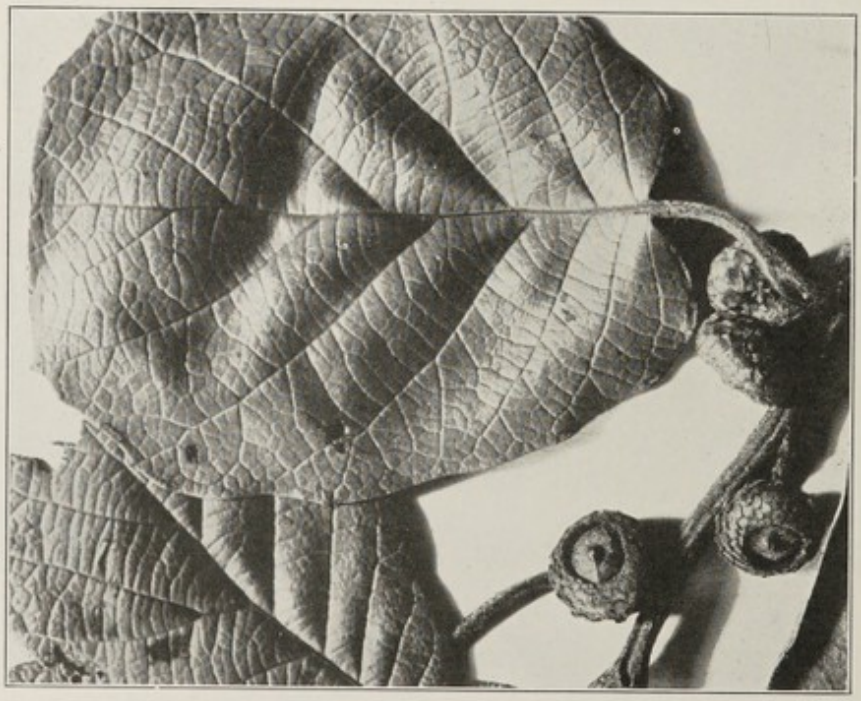


QUERCUS CONZATTII.

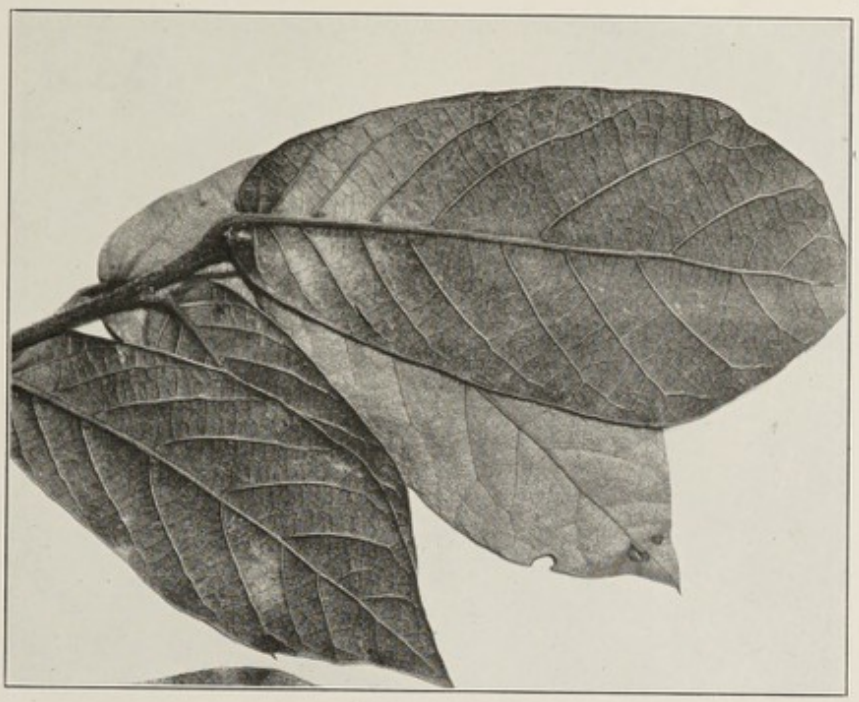


QUERCUS TEPICANA.





QUERCUS PENNIVENIA.



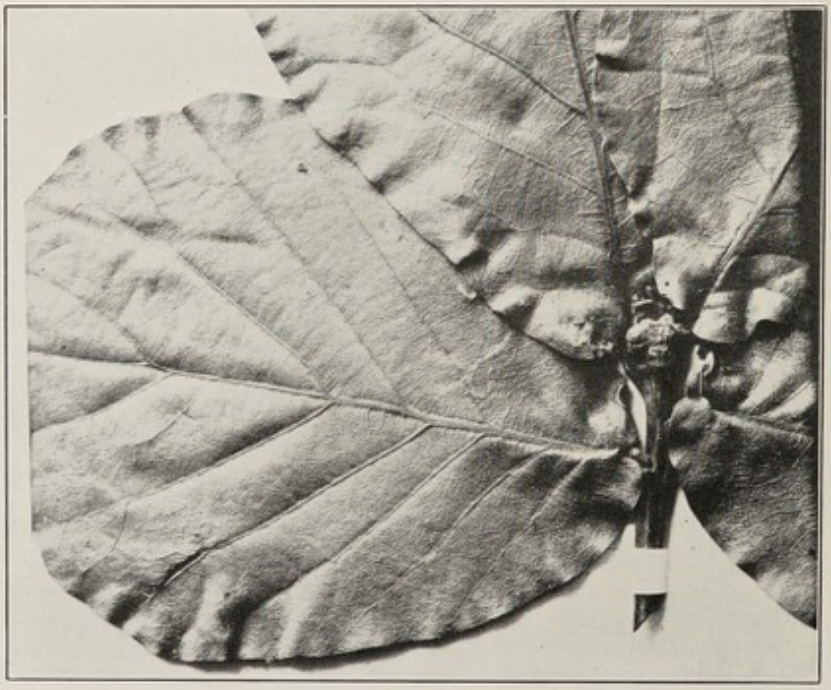
QUERCUS AEREA.



QUERCUS JONESI.

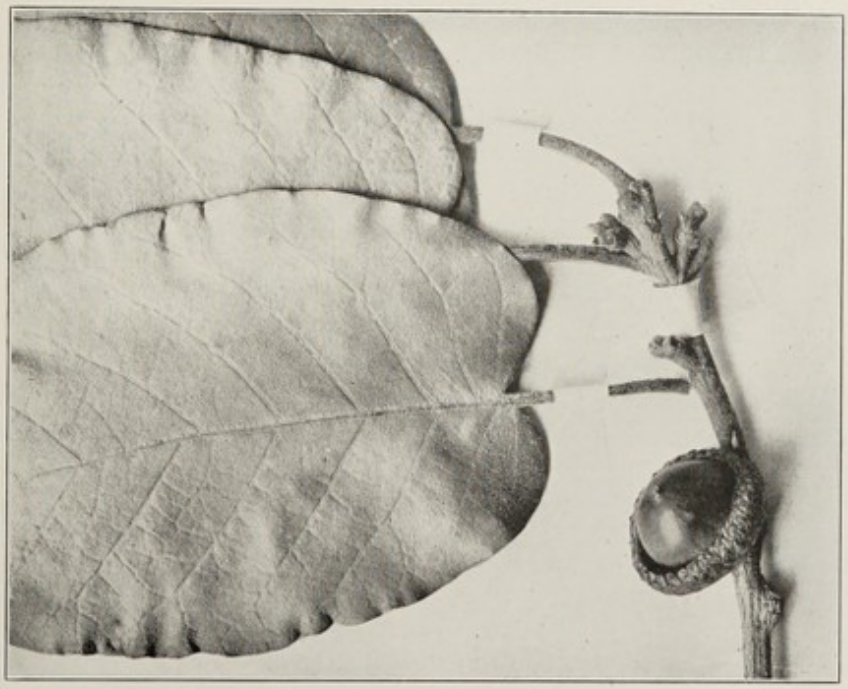
27837—24——17





QUERCUS COCCOLOBAEFOLIA.





QUERCUS PLANIPOCULA.





QUERCUS ROSEI.



QUERCUS COFFEAECOLOR.



QUERCUS AEQUIVENULOSA.





QUERCUS PRAINEANA.





QUERCUS LANGLASSEI.



QUERCUS CHIQUIHUITILLONIS.



QUERCUS PRODUCTIPES.



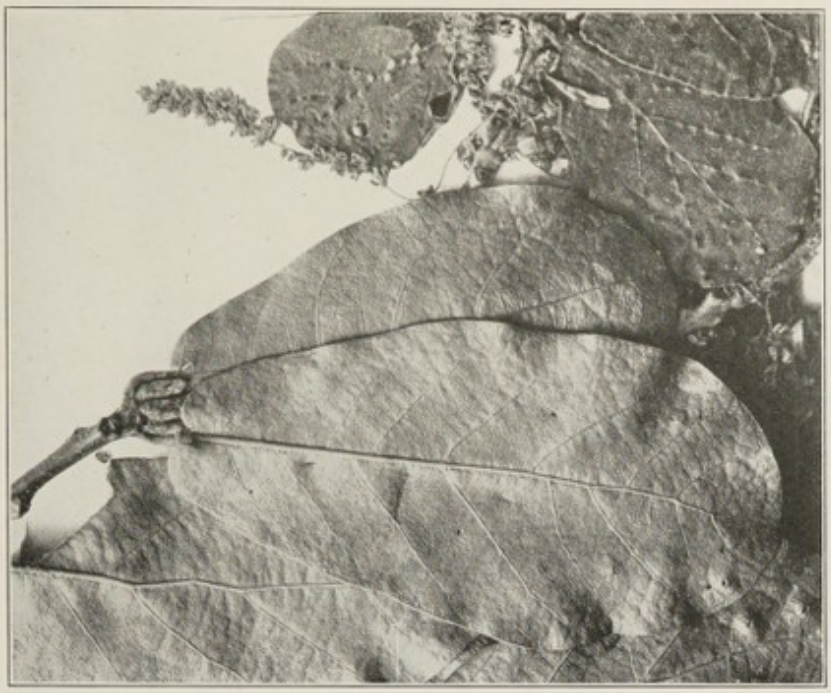
QUERCUS ARISTATA.



QUERCUS EXARISTATA.

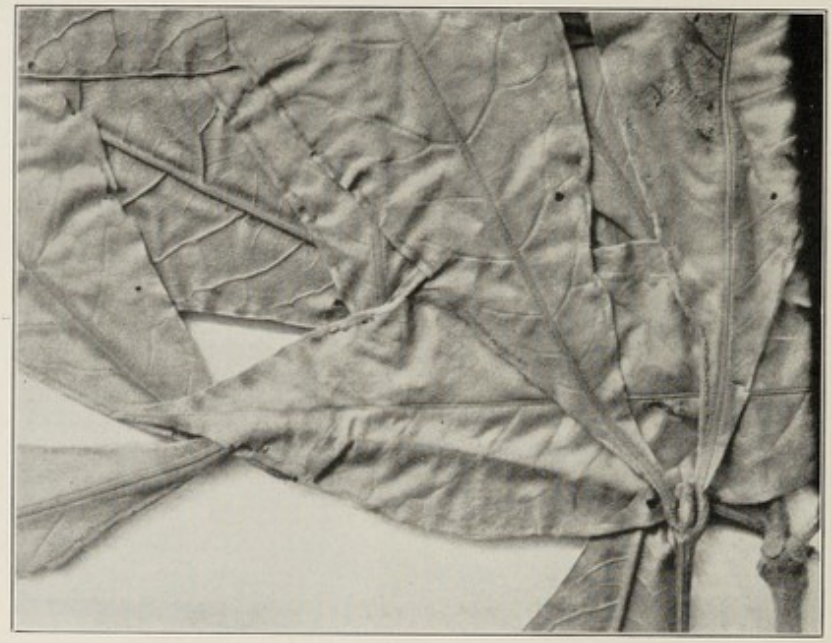


QUERCUS HONDURENSIS.

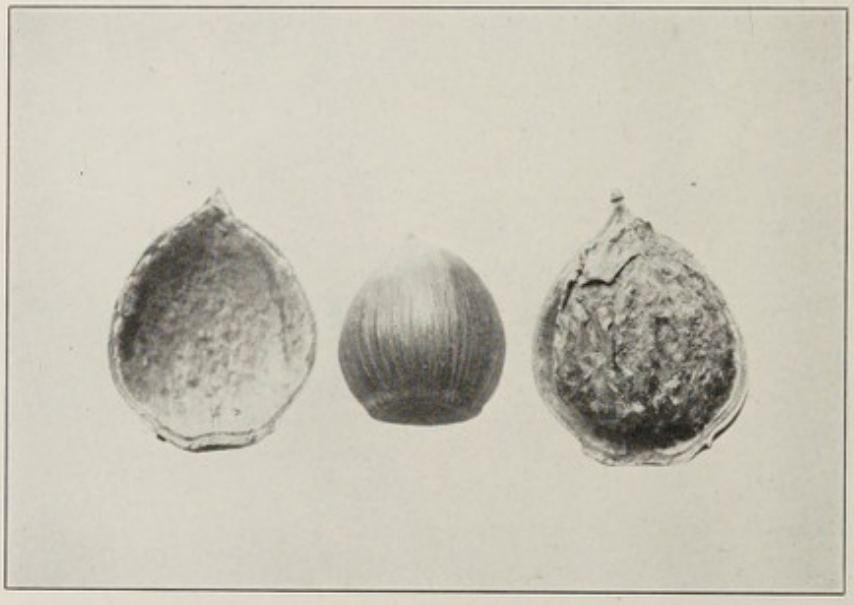




QUERCUS ENDLICHIANA.



QUERCUS AMPHIOXYS.



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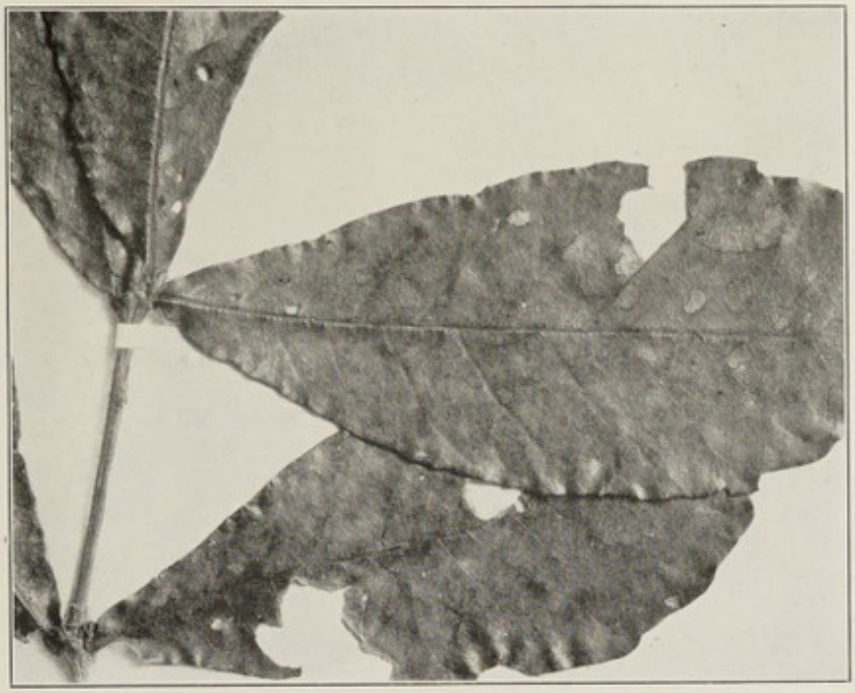

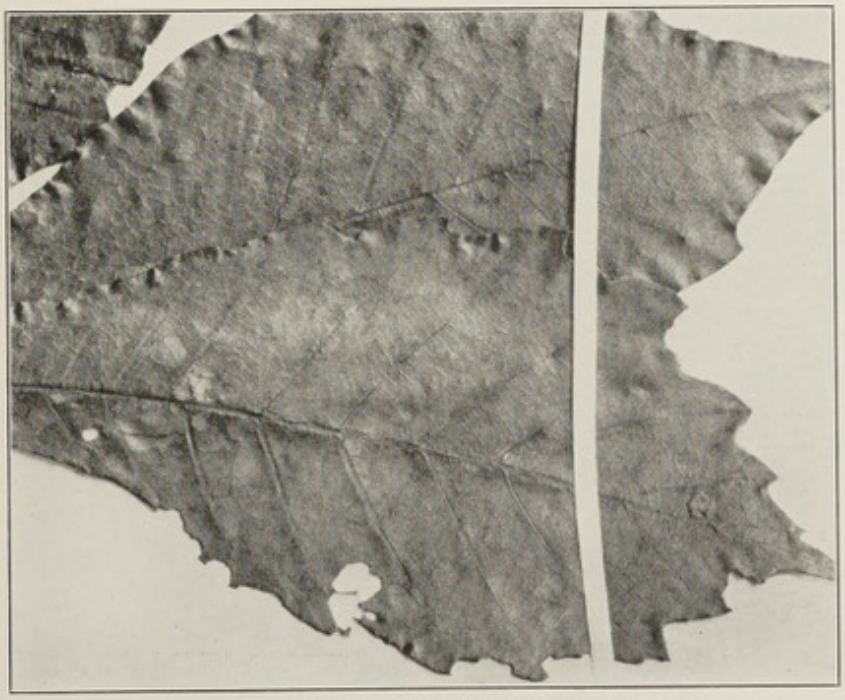

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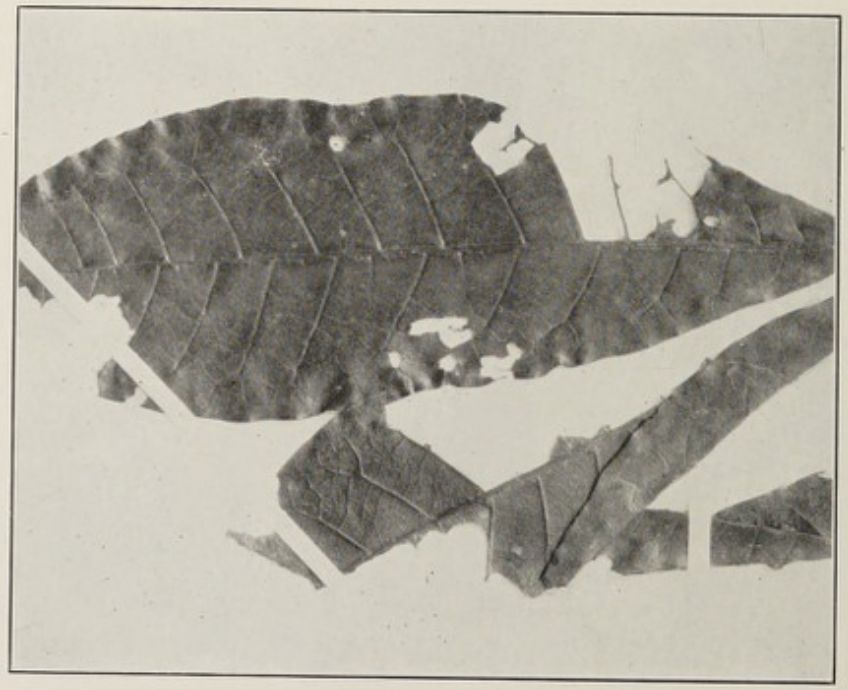


QUERCUS TOLIMENSIS.





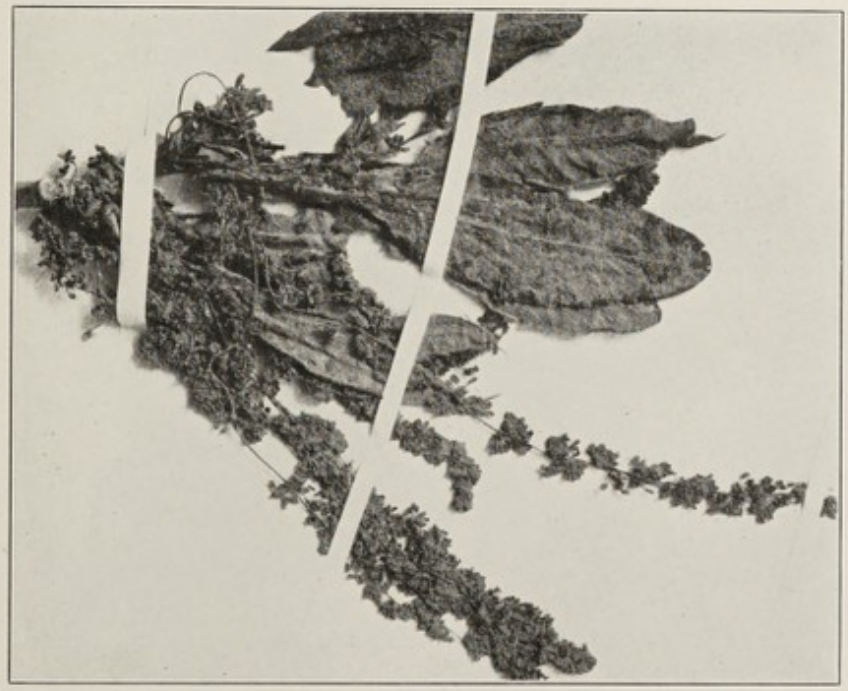
QUERCUS TOLIMENSIS.



QUERCUS HUMBOLDTII.



QUERCUS HUMBOLDTII.



QUERCUS HUMBOLDTII LEHMANNIANA.

27837—24——18

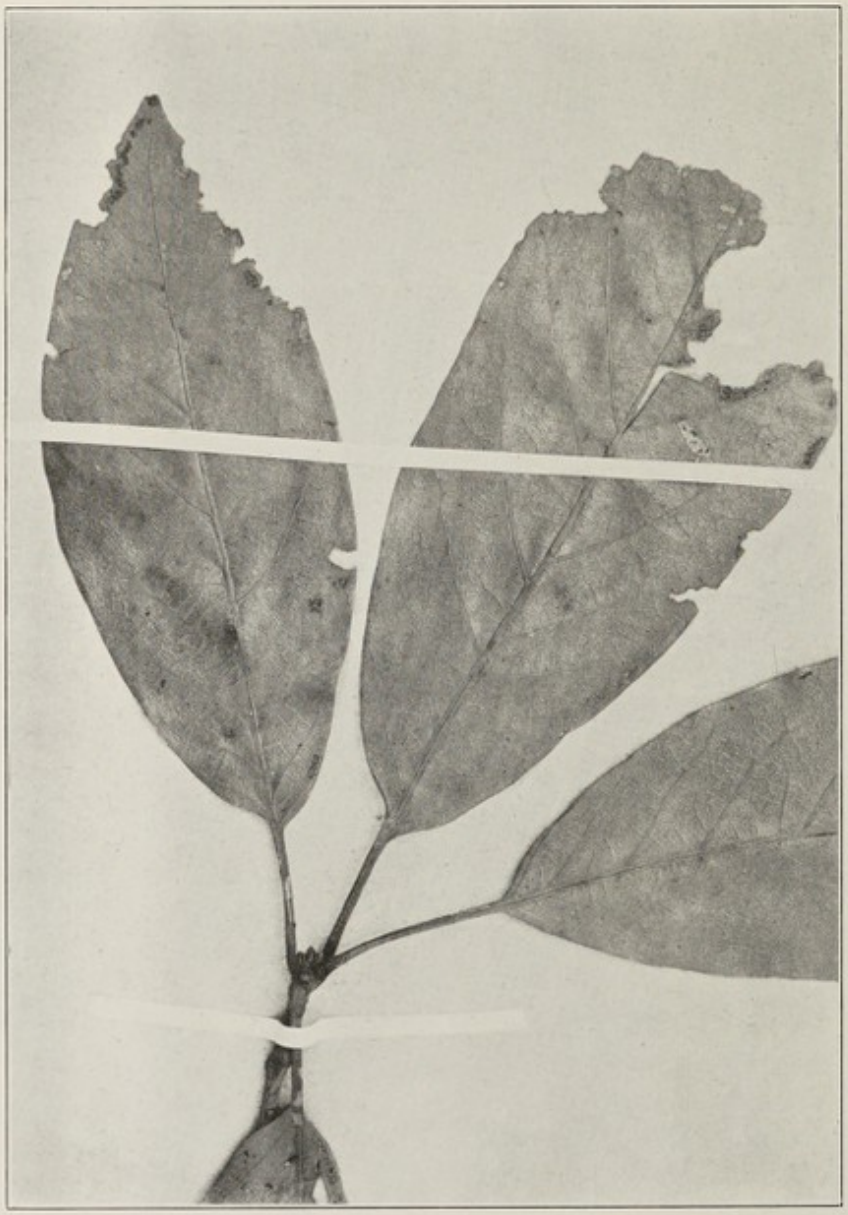




QUERCUS LINDENI.



QUERCUS RAPURAHUENSIS.



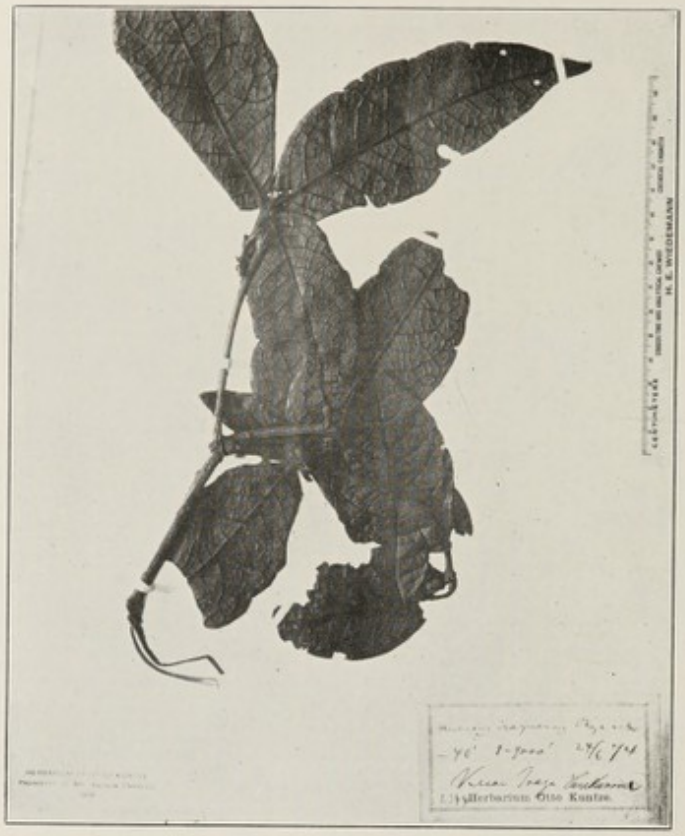
QUERCUS URUAPANENSIS.

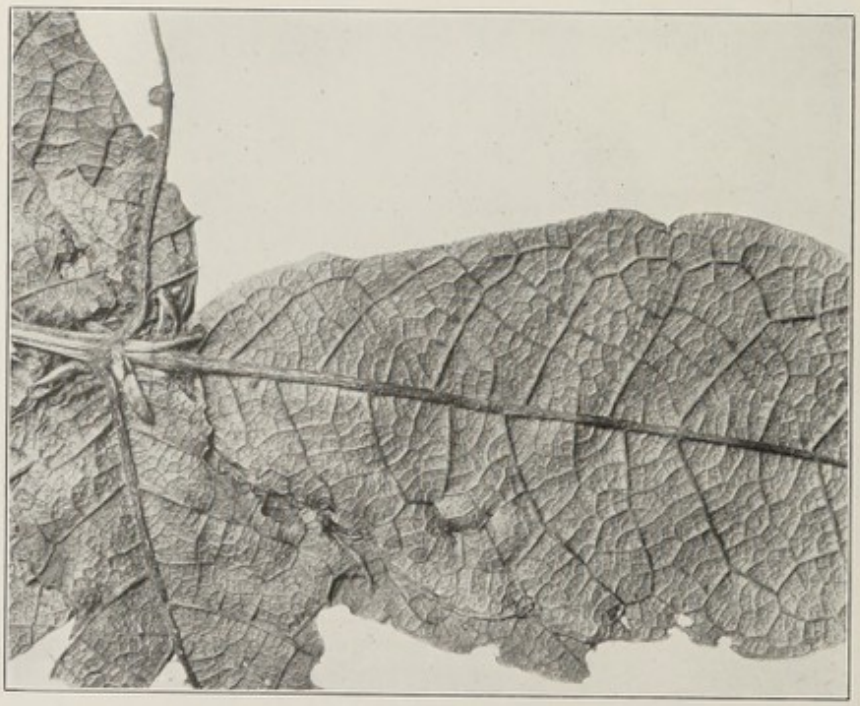


QUERIUS URUAPANENSIS.

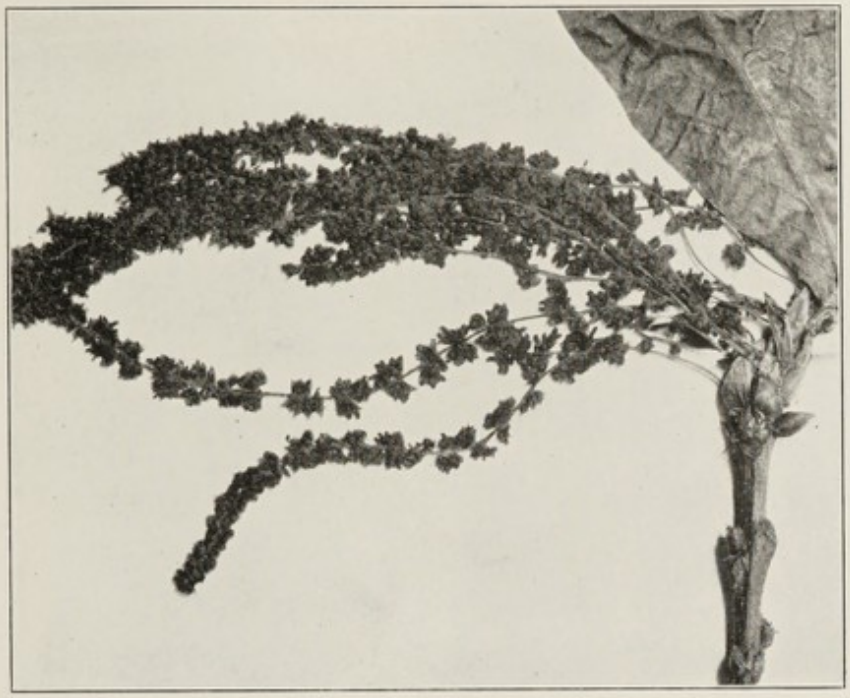


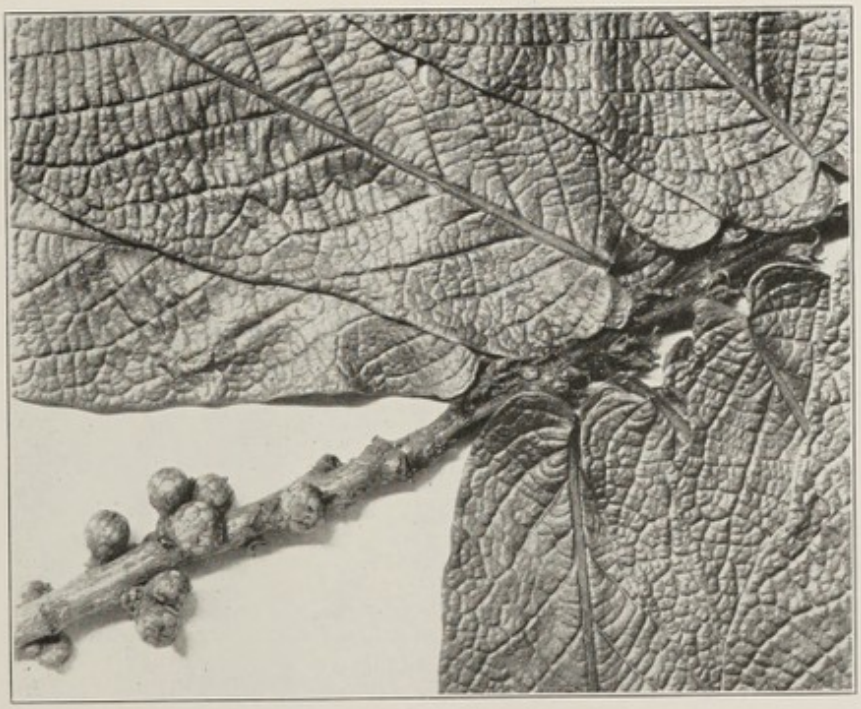
QUERCUS TRINITATIS.





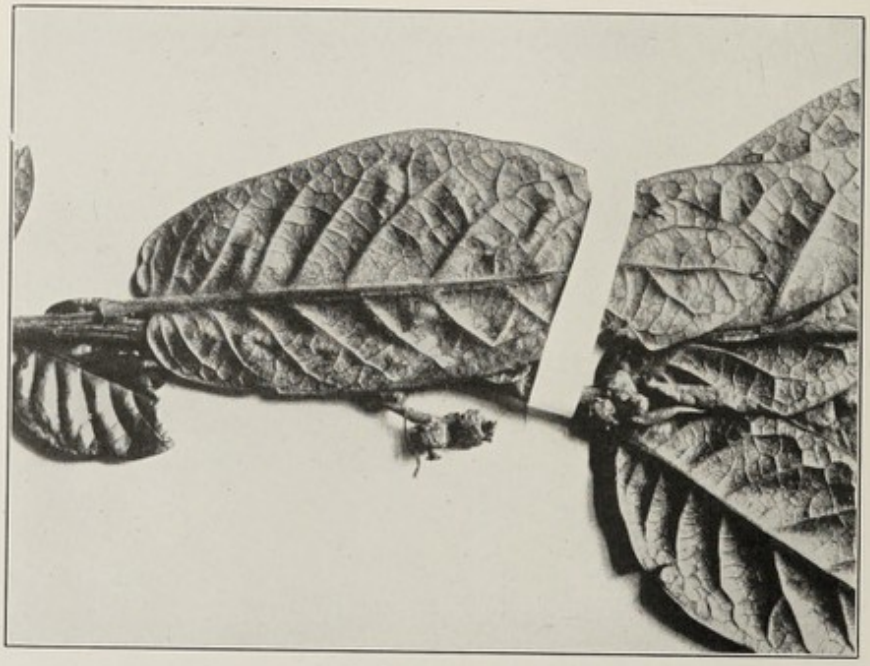
QUERCUS IRAZUENSIS.





QUERCUS RYSOPHYLLA.



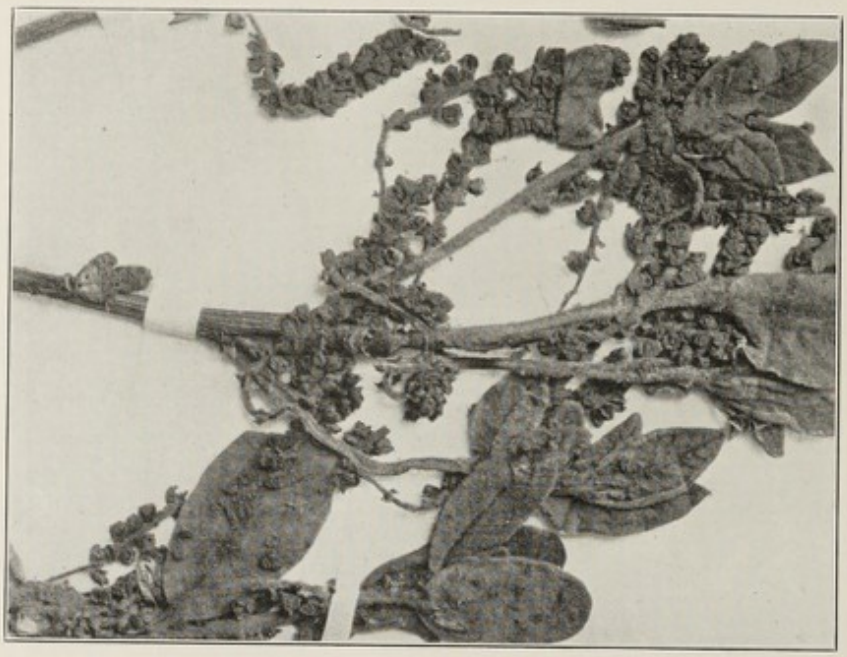


QUERCUS ENDRESI.





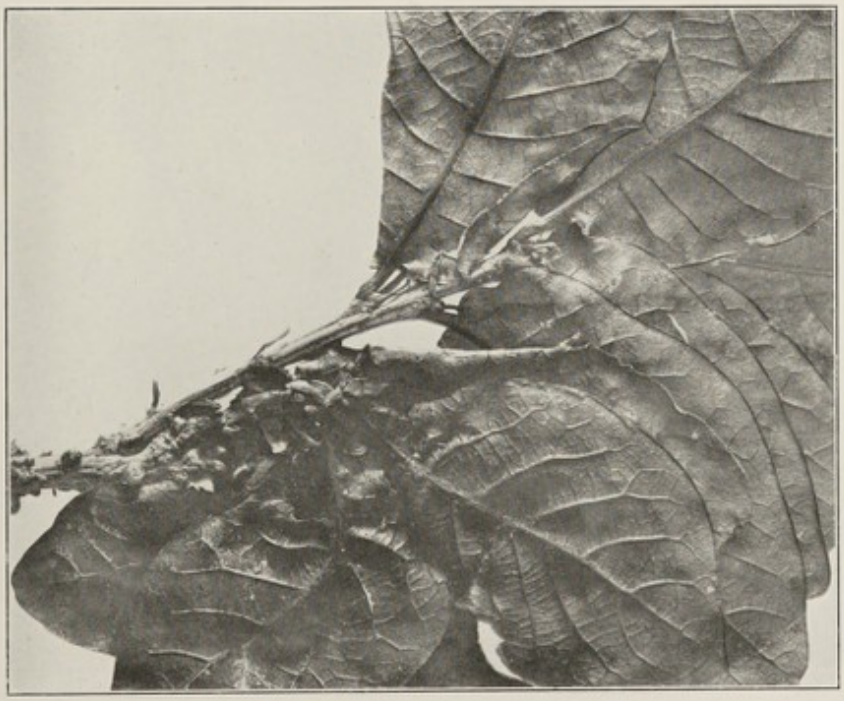
QUERCUS COSTARICENSIS.



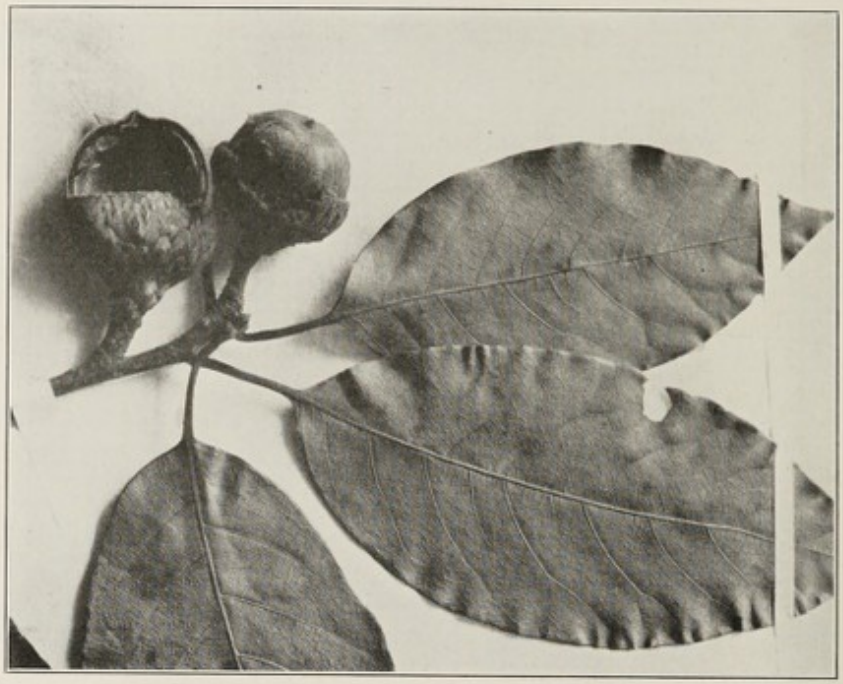


QUERCUS COSTARICENSIS.





QUERCUS COSTARICENSIS KUNTZEI.

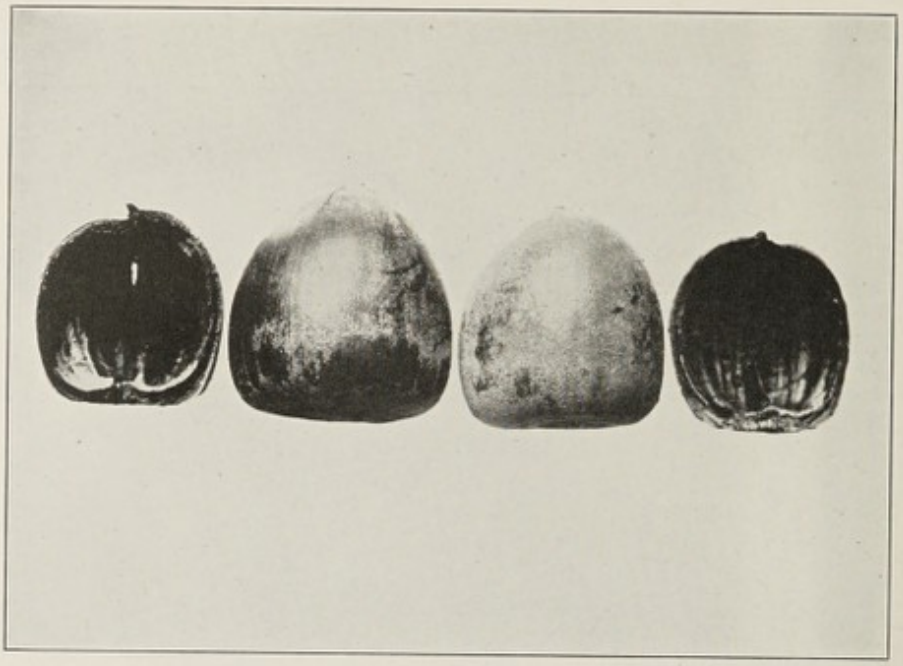


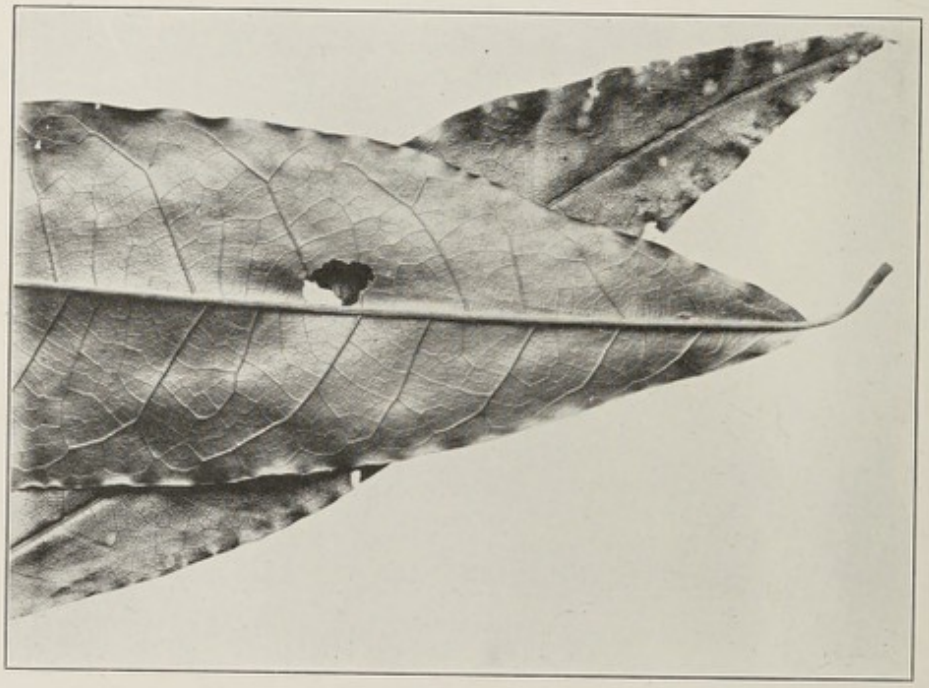


QUERCUS BENTHAMI.

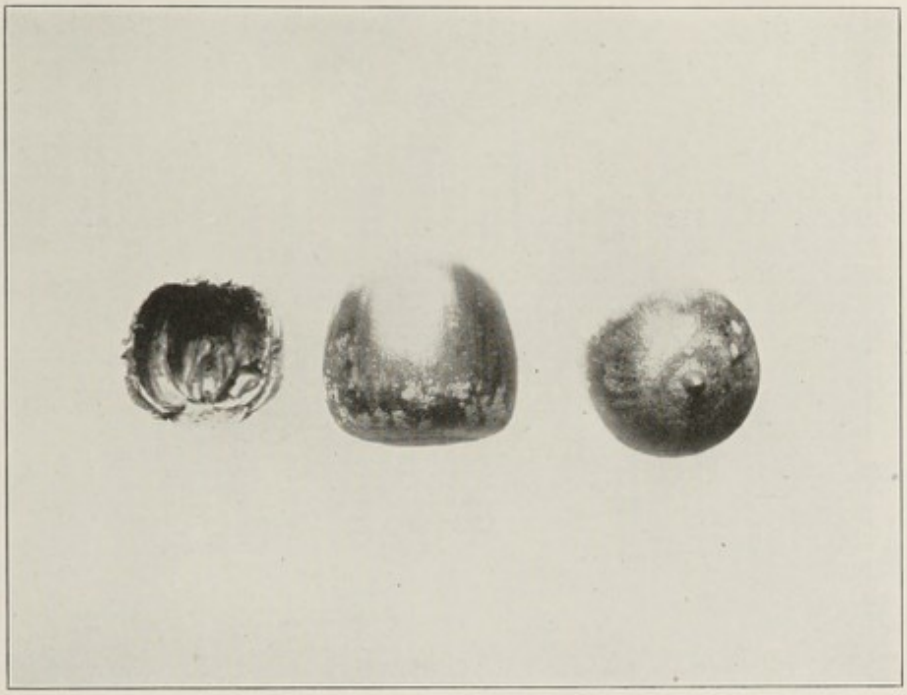


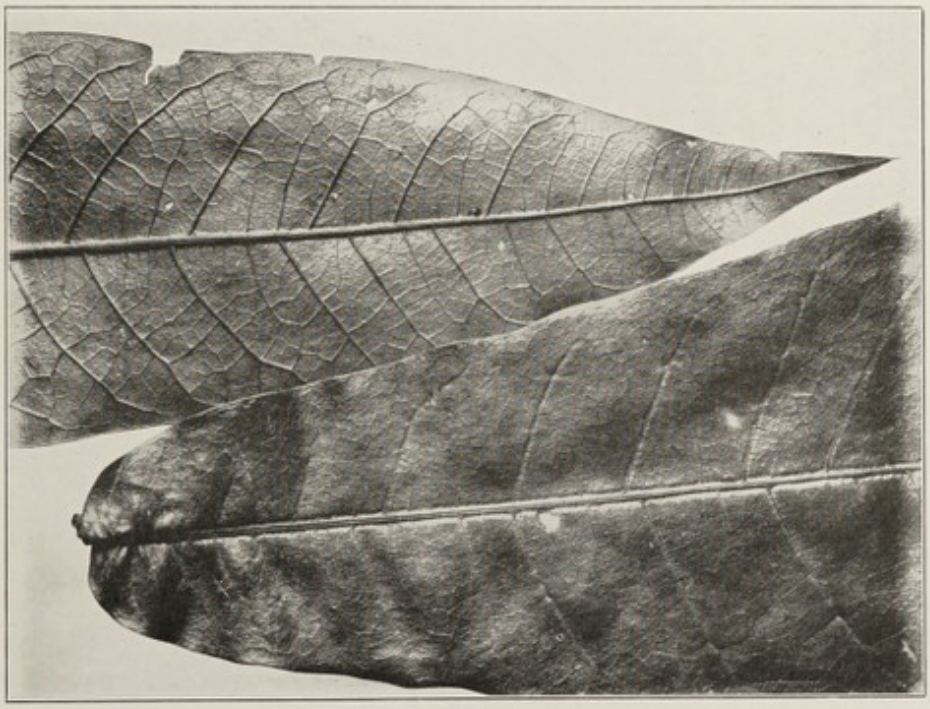
QUERCUS TONDUZII.





QUERCUS CRISPIFOLIA.





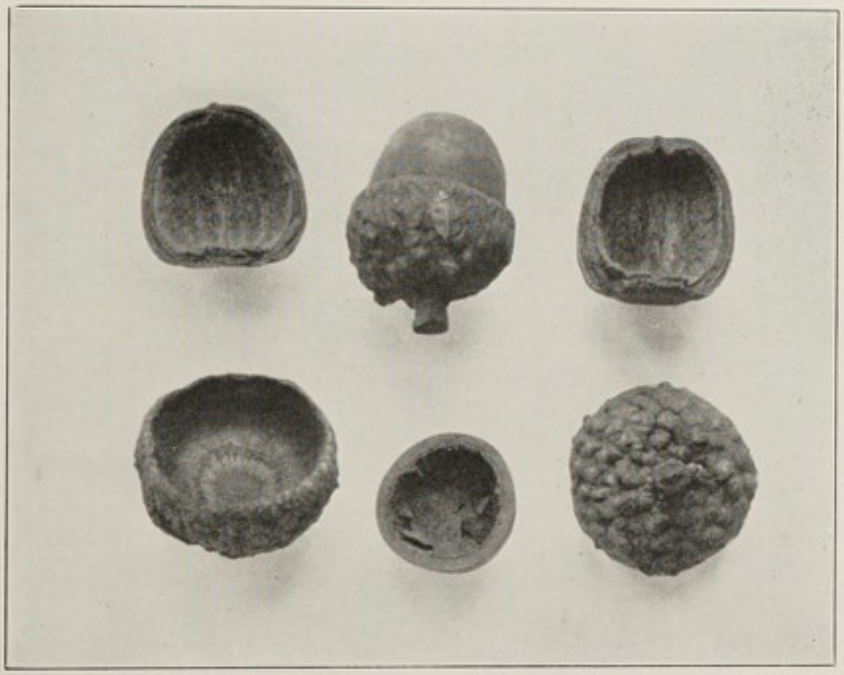
QUERCUS INCRASSATA.





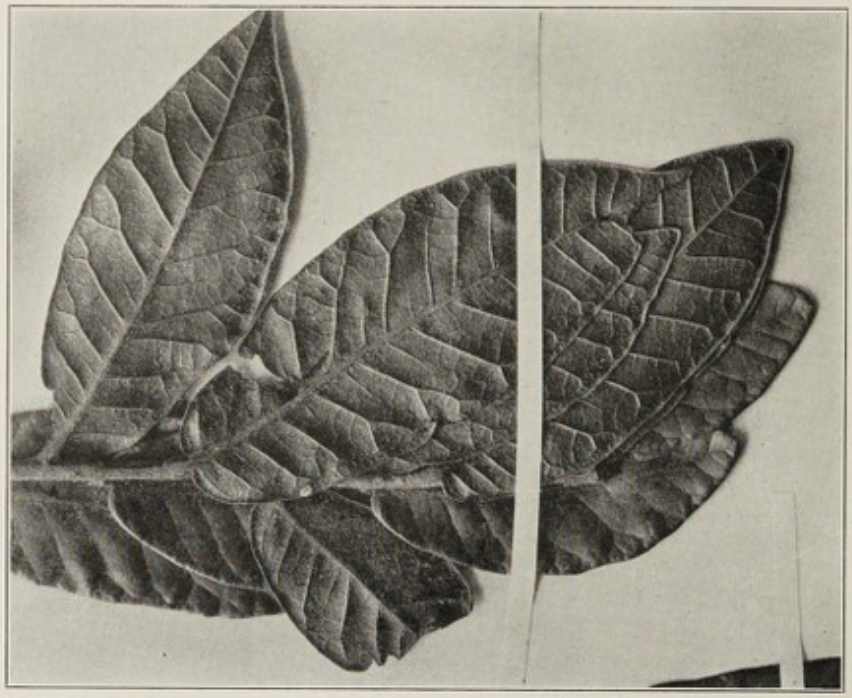
QUERCUS CITRIFOLIA.





QUERCUS NECTANDRAEFOLIA.

27837—24——19





QUERCUS LINGVAEFOLIA.



QUERCUS SAPOTAEFOLIA.



QUERCUS BUMELIOIDES.





QUERCUS PERSEAEFOLIA.



QUERCUS PERSEAEFOLIA.



QUERCUS PUBINERVIS.



QUERCUS OAJACANA.

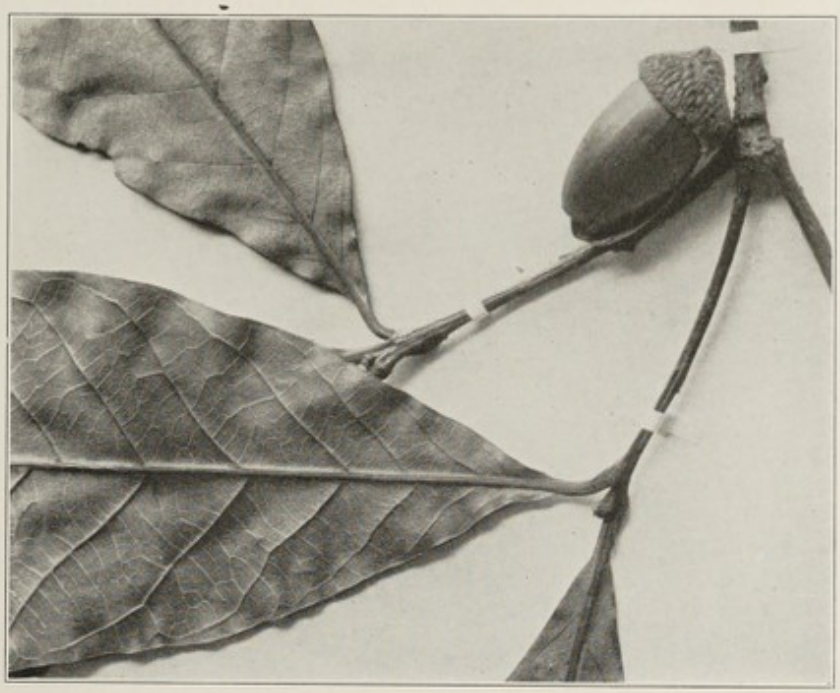




QUERCUS BOTRYOCARPA.



QUERCUS SYNTHETICA CRENIFOLIA.



QUERCUS SYNTHETICA.



QUERCUS TOTUTLENSIS.





QUERCUS PARVIGLANS.



QUERCUS PARVIGLANS POLYCARPA.



QUERCUS GEMMATA.

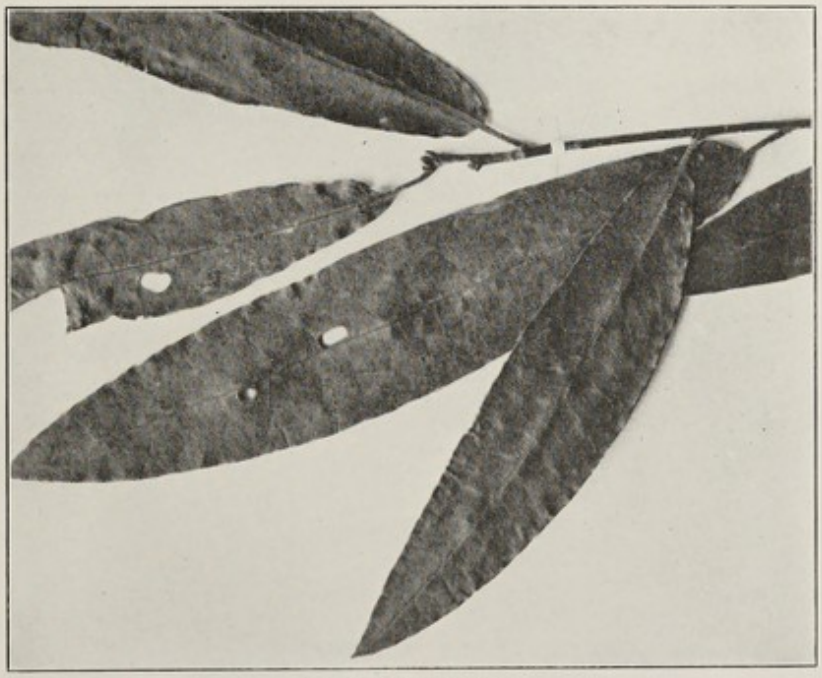


QUERCUS GUATIMALENSIS.



QUERCUS CORREPTA.

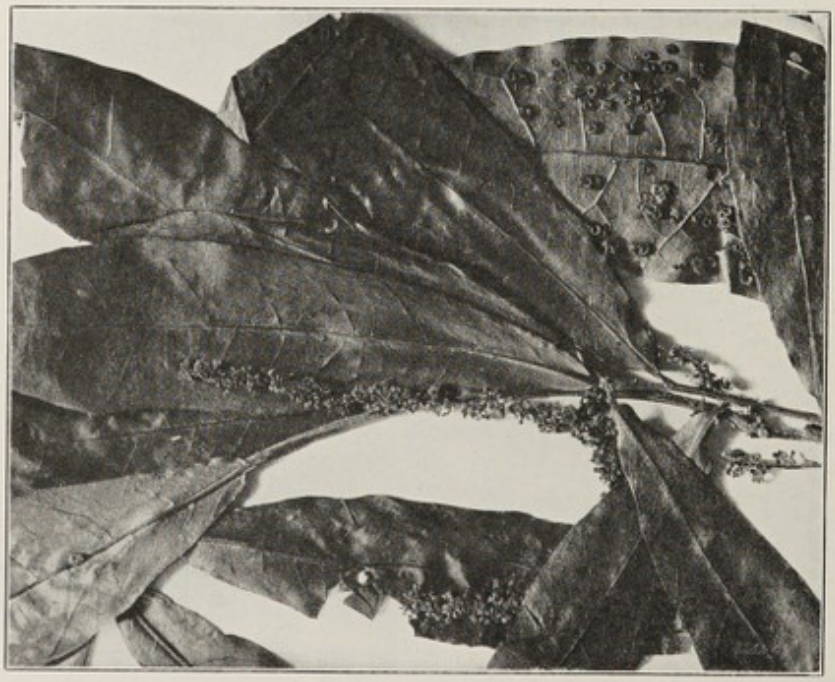




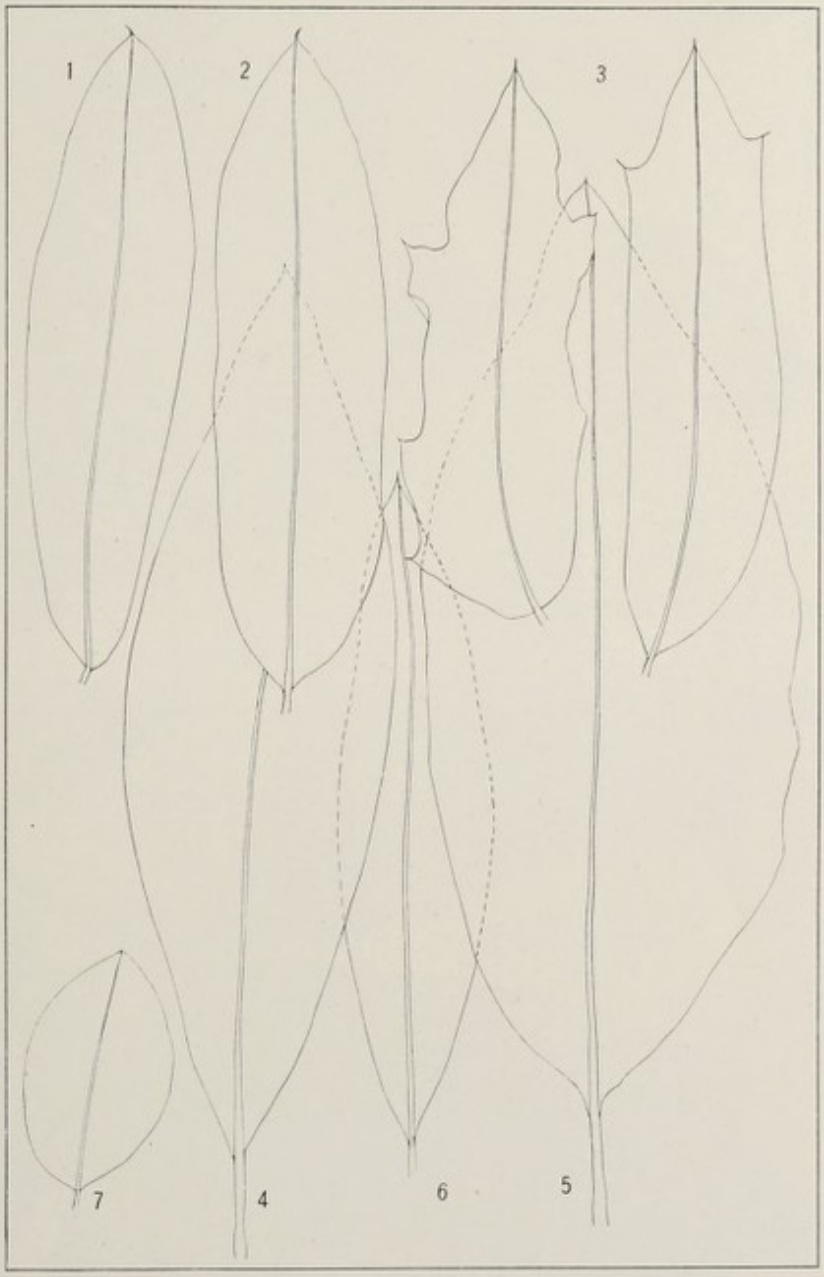
QUERCUS SALICIFOLIA.



QUERCUS ACAPULCENSIS.

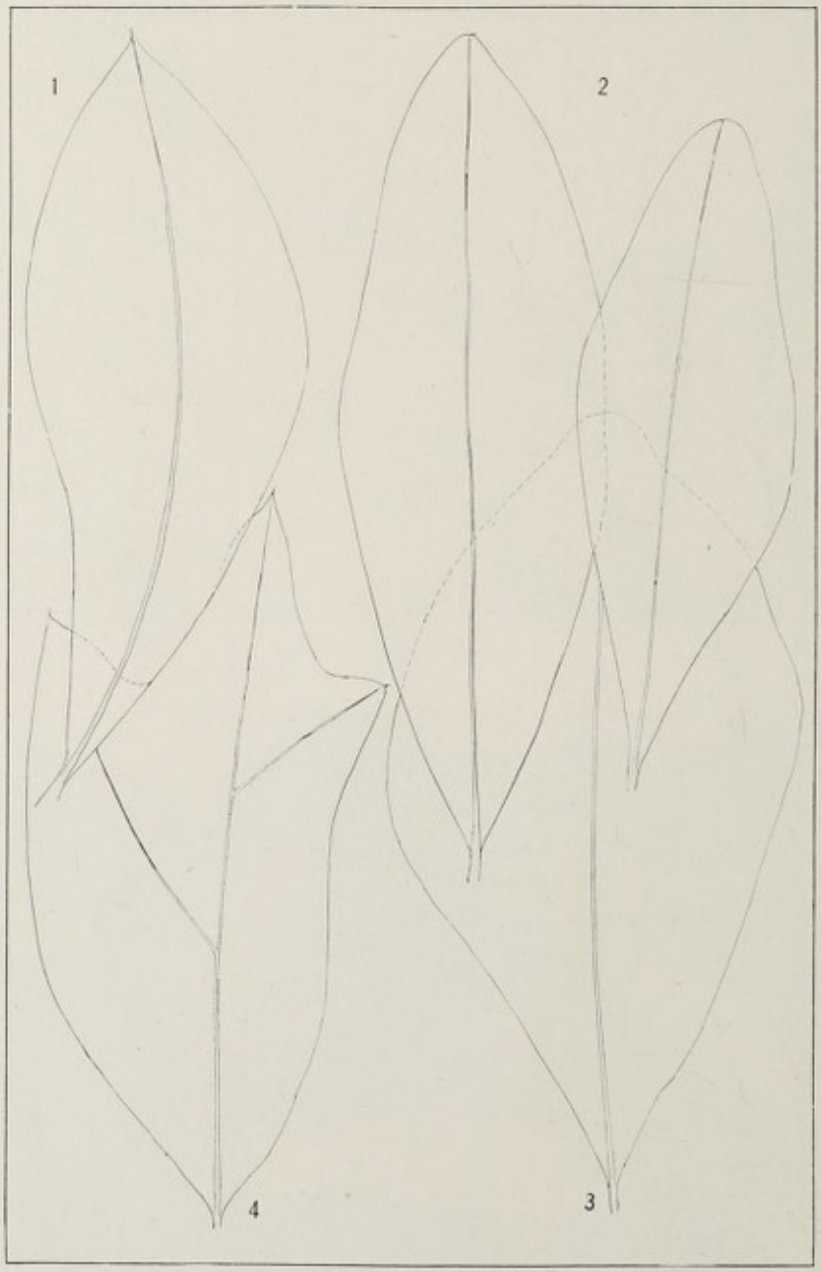


QUERCUS TAHUASALANA.



QUERCUS—THE LAURIFOLIAE.

Q pumila (1), Q. cinerea (2), and f. dentato-lobata (3), Q. imbricaria (4, 5), Q. phellos (6), Q. myrtifolia (7).



QUERCUS LAURIFOLIA.

f. typica (1), f. obtusa (2), f. rhombica (3), f. tridentata (4).



QUERCUS LAURIFOLIA RHOMBICA.



QUERCUS LAURIFOLIA TRIDENTATA.

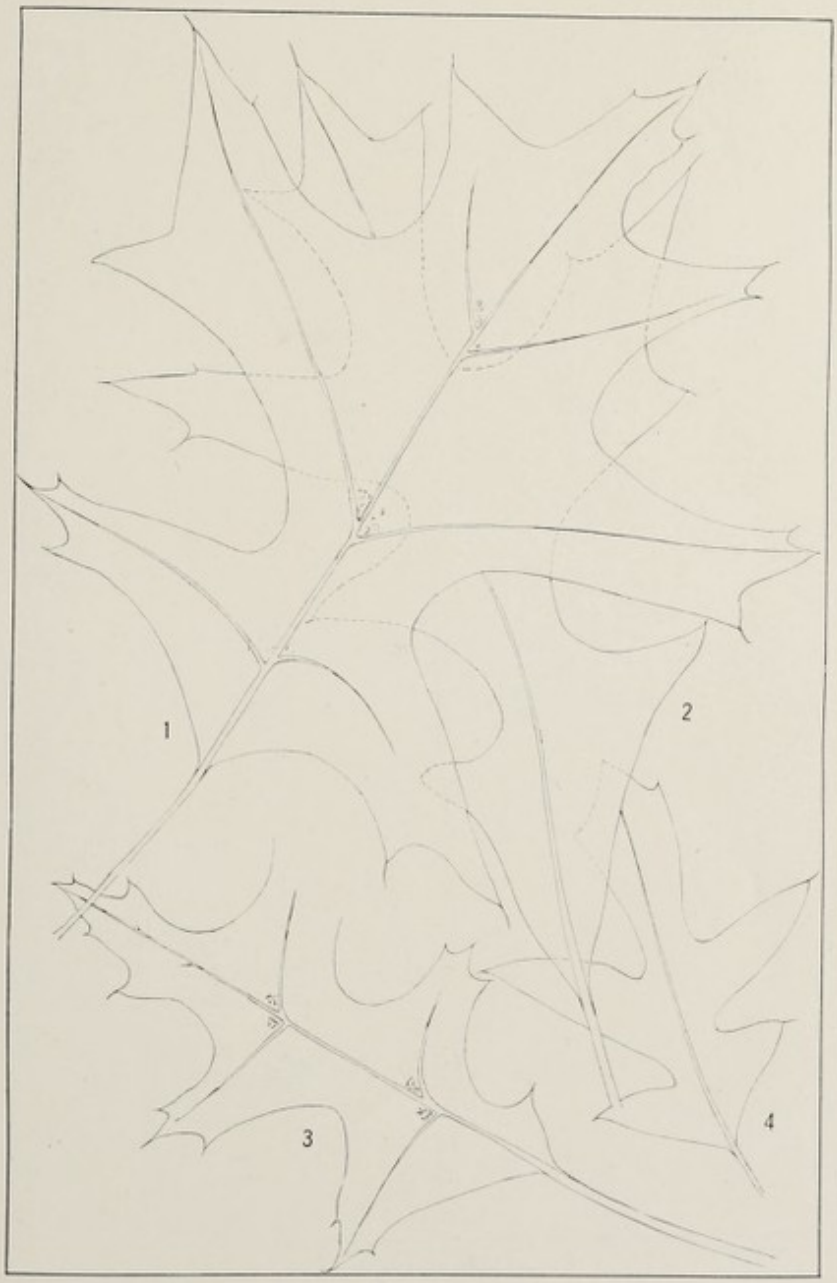
27837—24——20



QUERCUS LAURIFOLIA OBOVATIFOLIA.

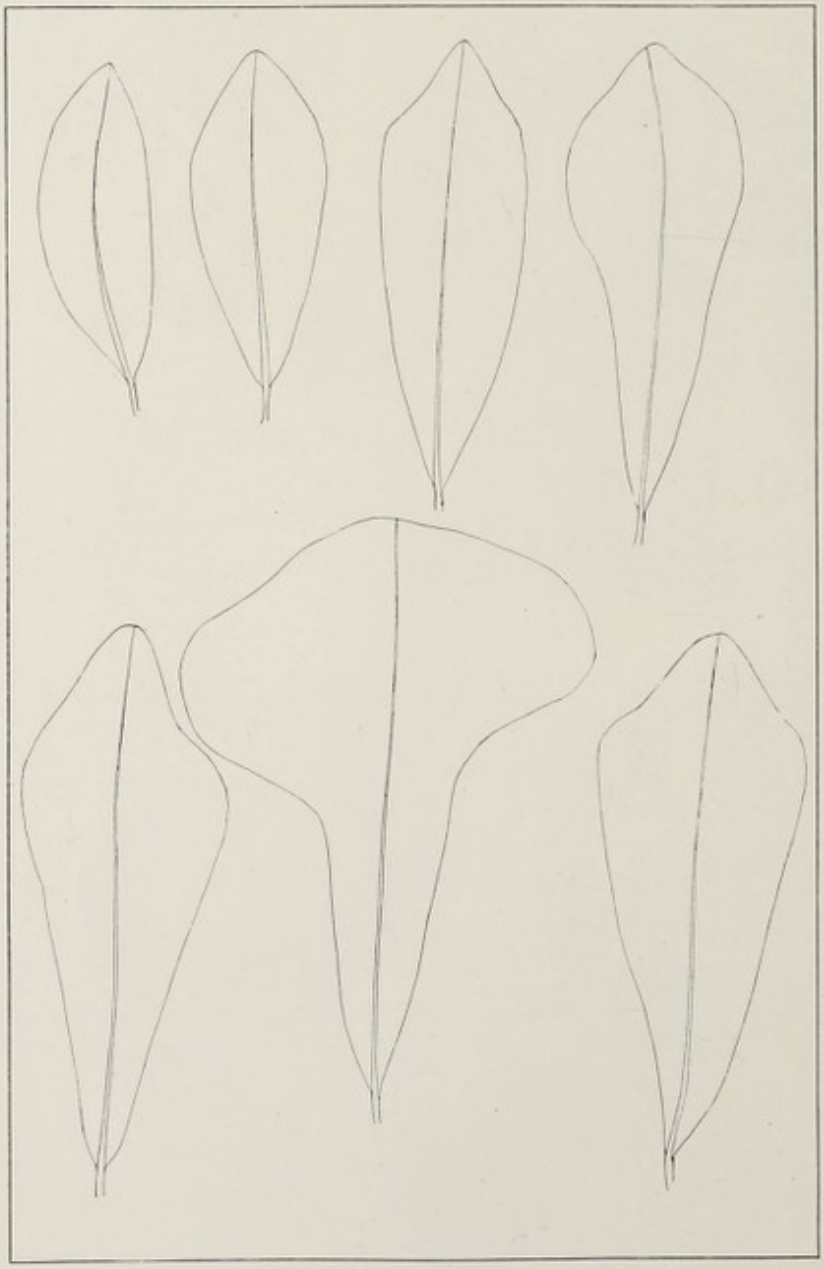


QUERCUS LAURIFOLIA DENTATA.

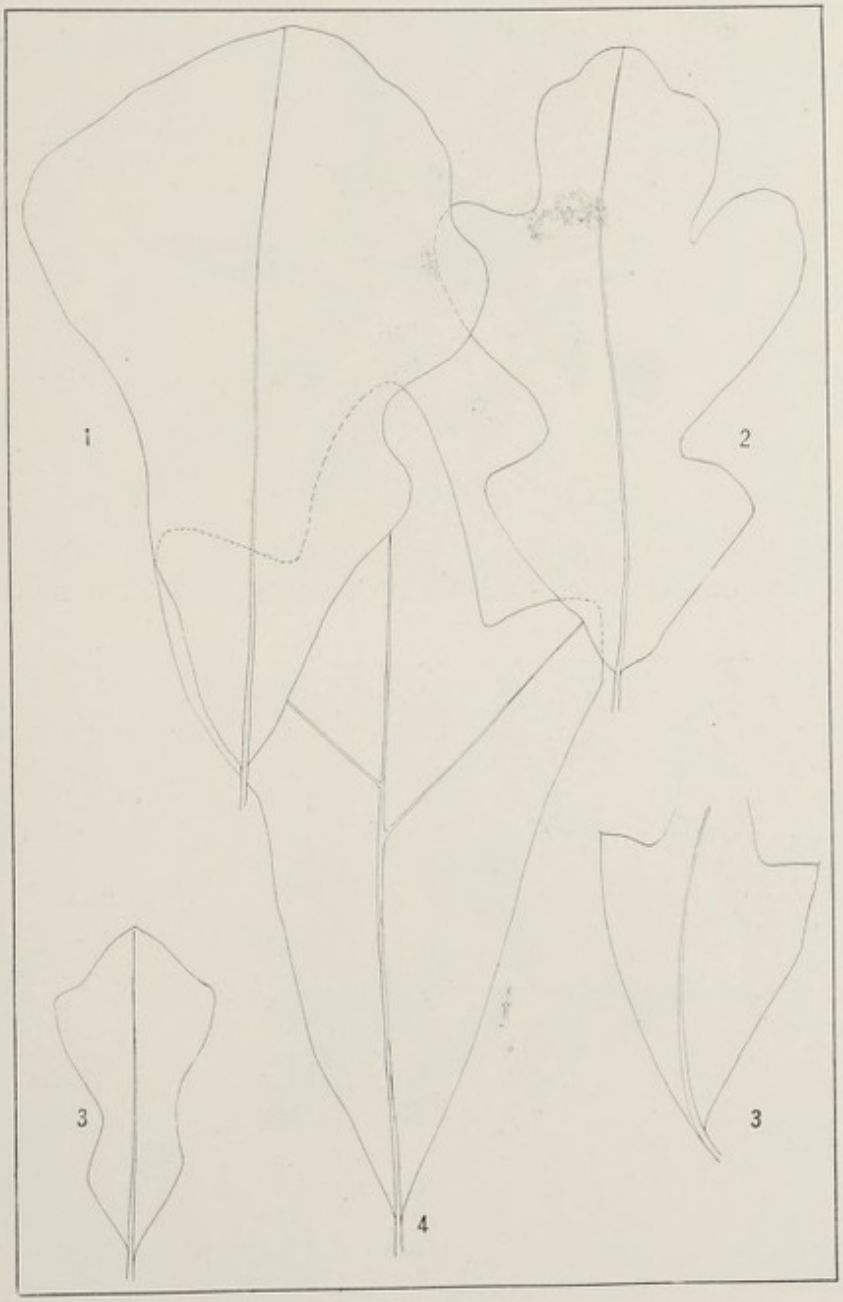


QUERCUS—THE PALUSTRES.

Q. palustris (1–3), Q. georgiana (4).

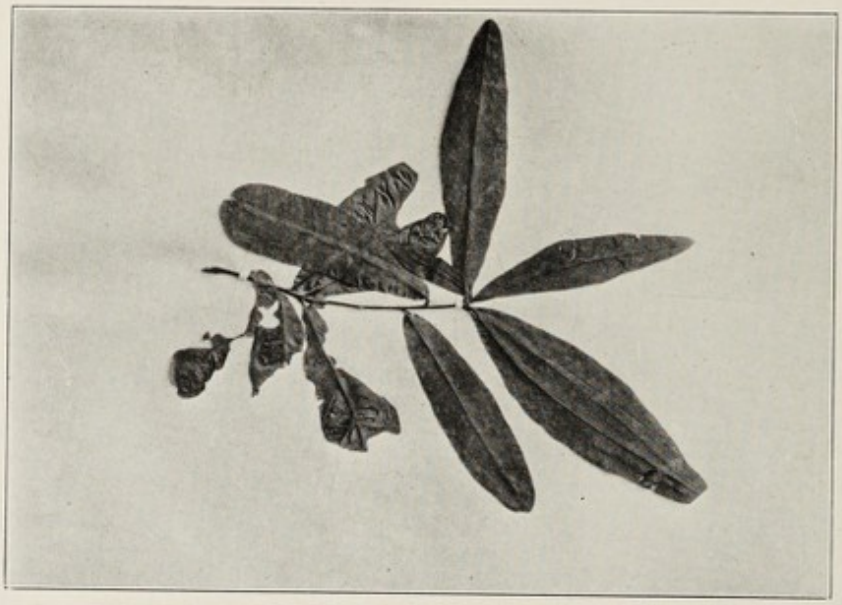


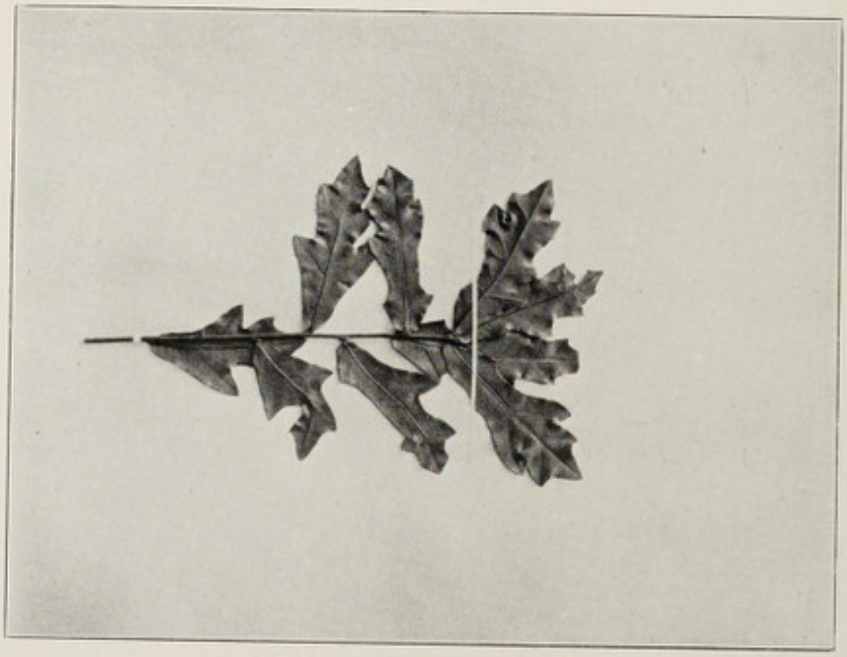
QUERCUS NIGRA.



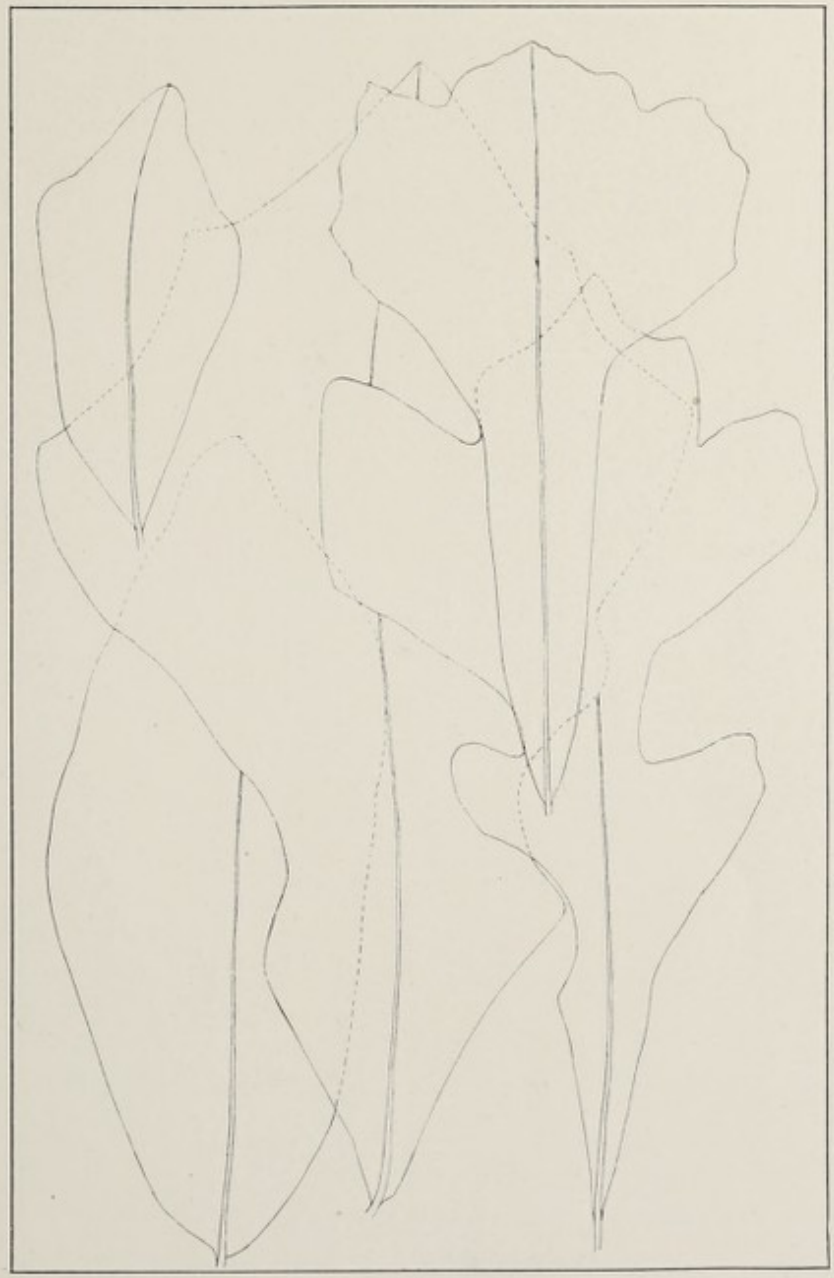
QUERCUS NIGRA.

f. microcarya (1), f. saxicola (2), f. plenocarpa (3), f. tridentifera (4).





QUERCUS NIGRA HEMISPHAERICA.



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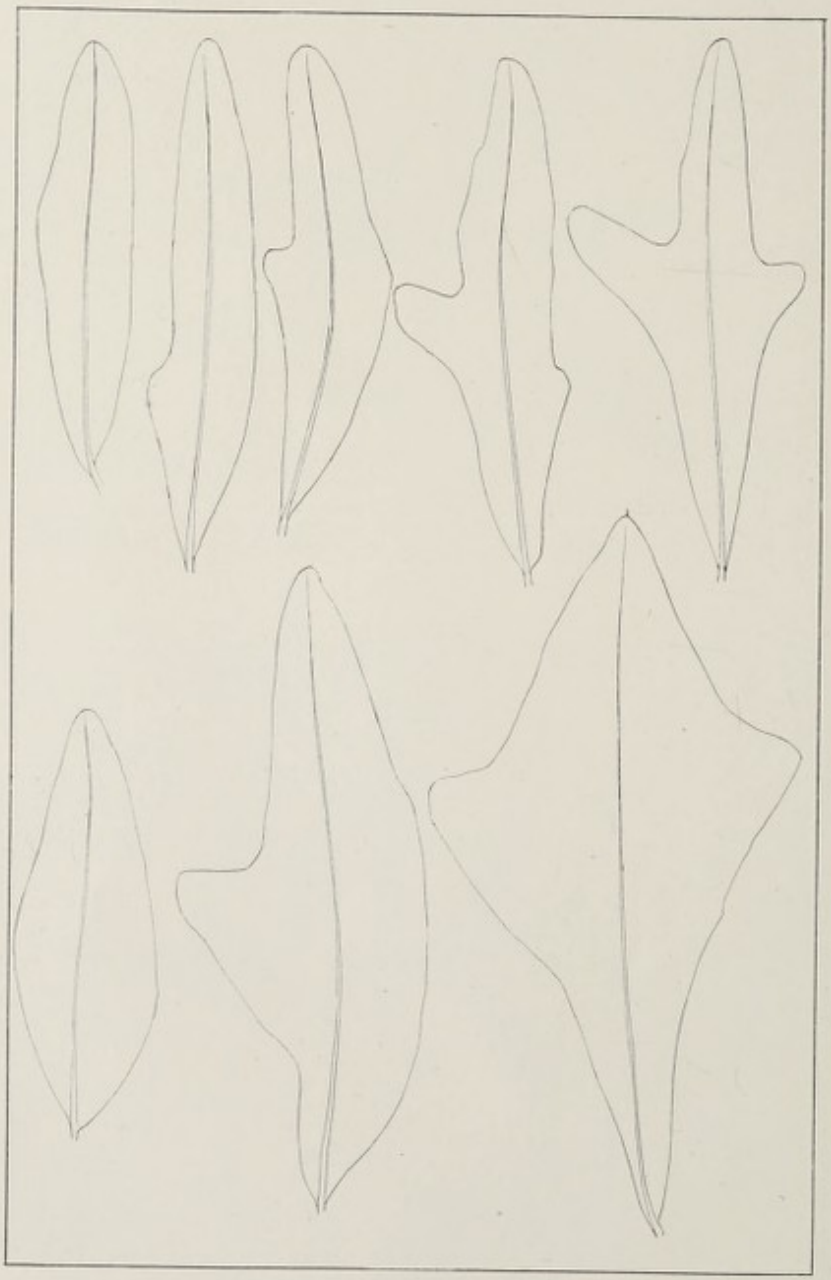

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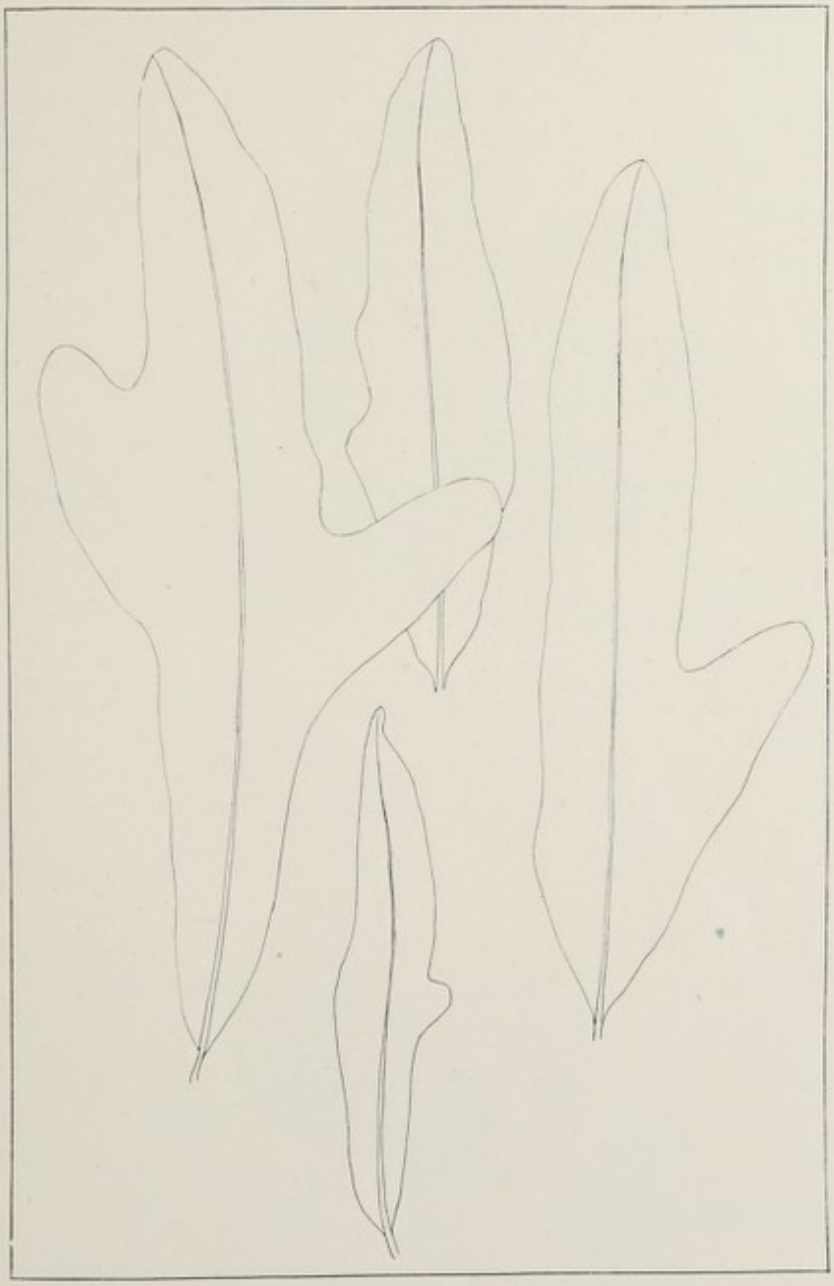

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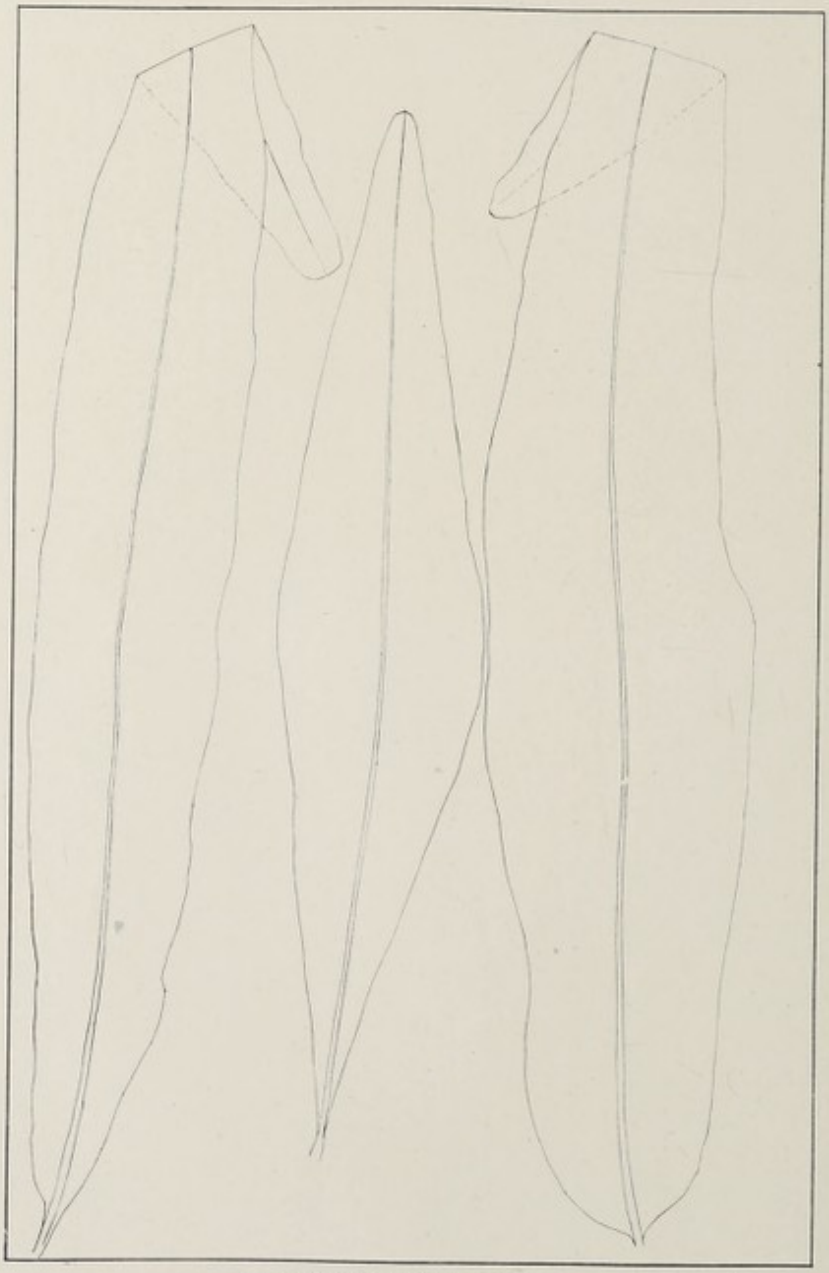

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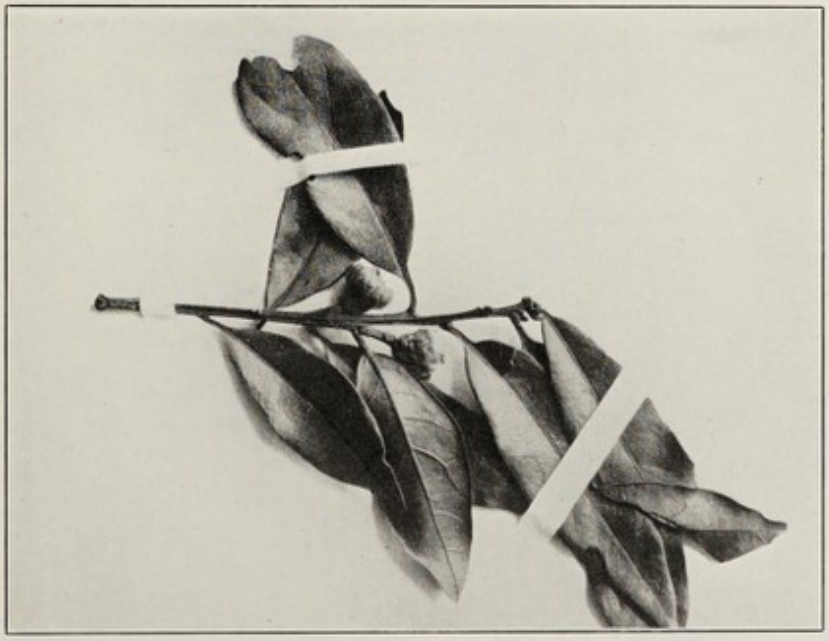
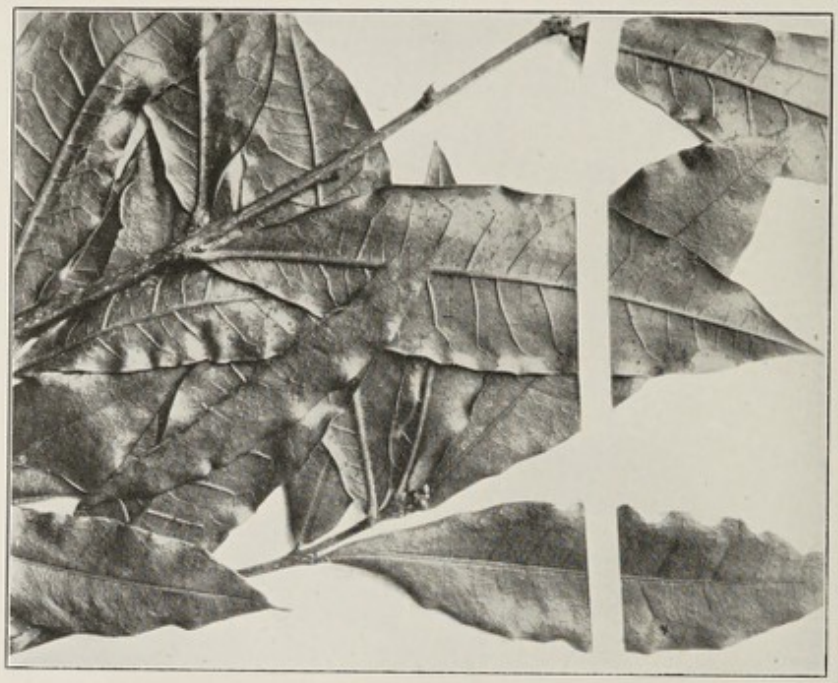
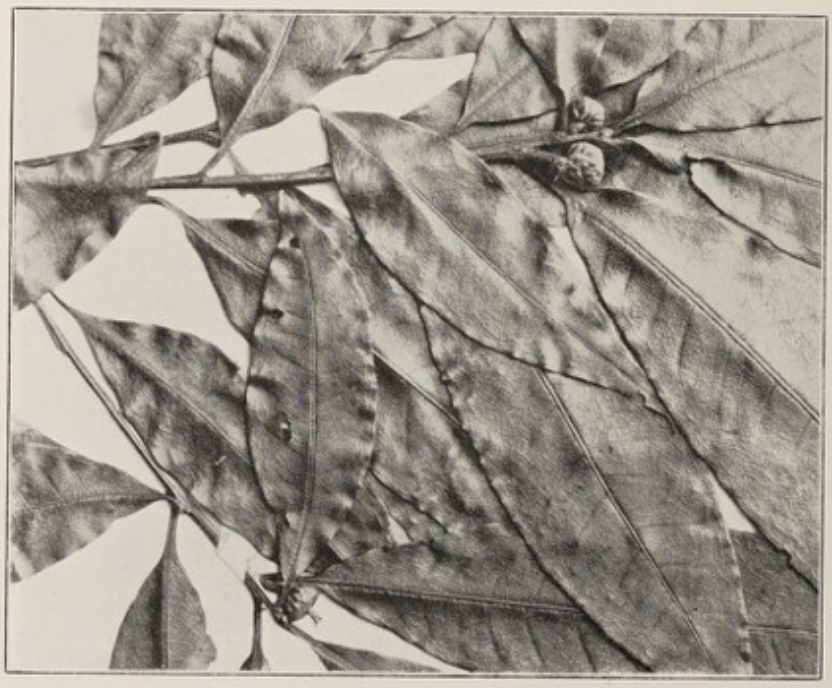


QUERCUS BORUCASANA.



QUERCUS EUGENIAEFOLIA.



QUERCUS EUGENIAEFOLIA PETIOLATA.





QUERCUS SEEMANNI.





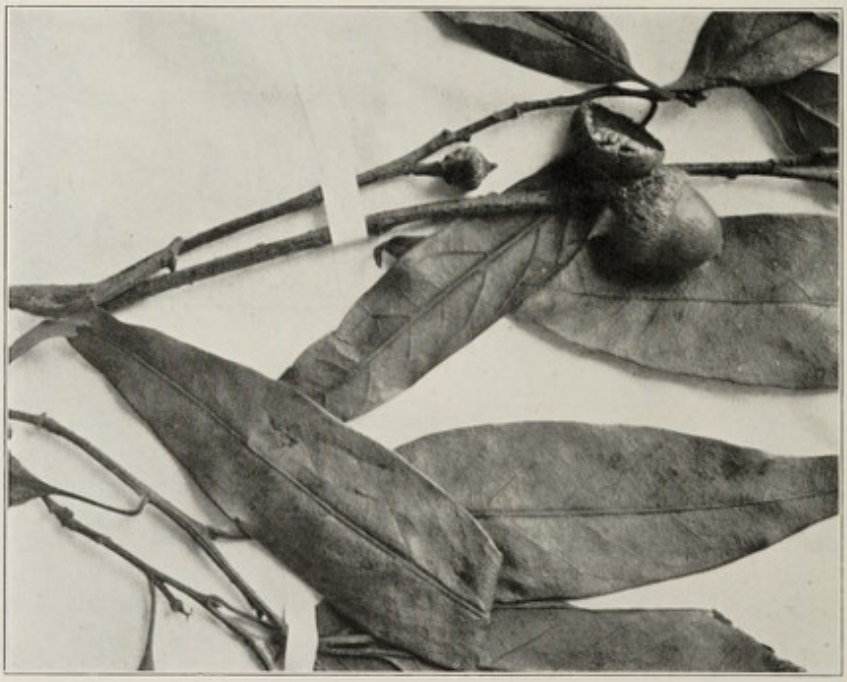
QUERCUS DONNELL-SMITHII.





QUERCUS FLAGELLIFERA.

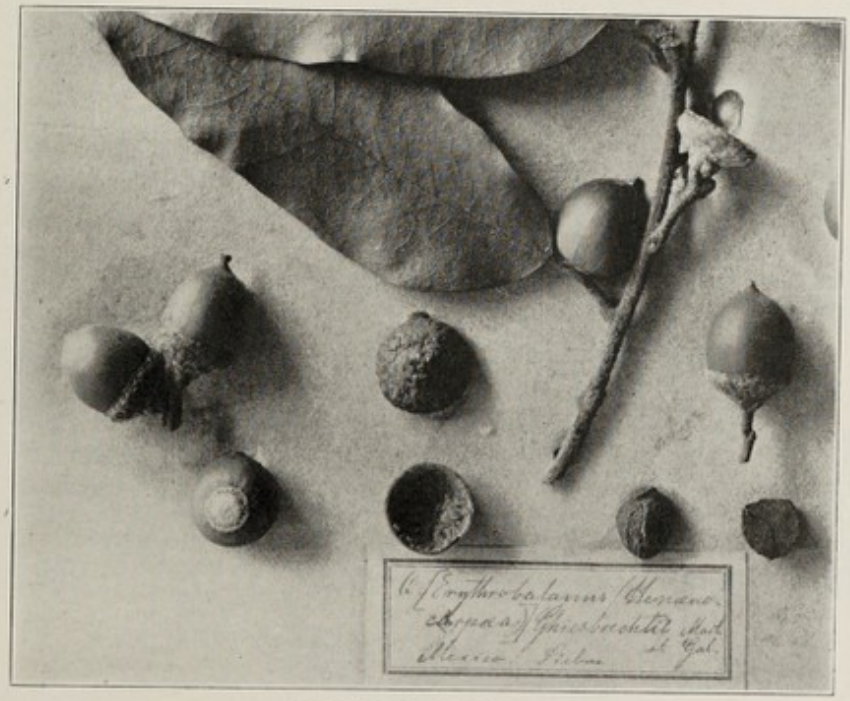




QUERCUS ACATENANGENSIS.



QUERCUS CAERULEOCARPA.



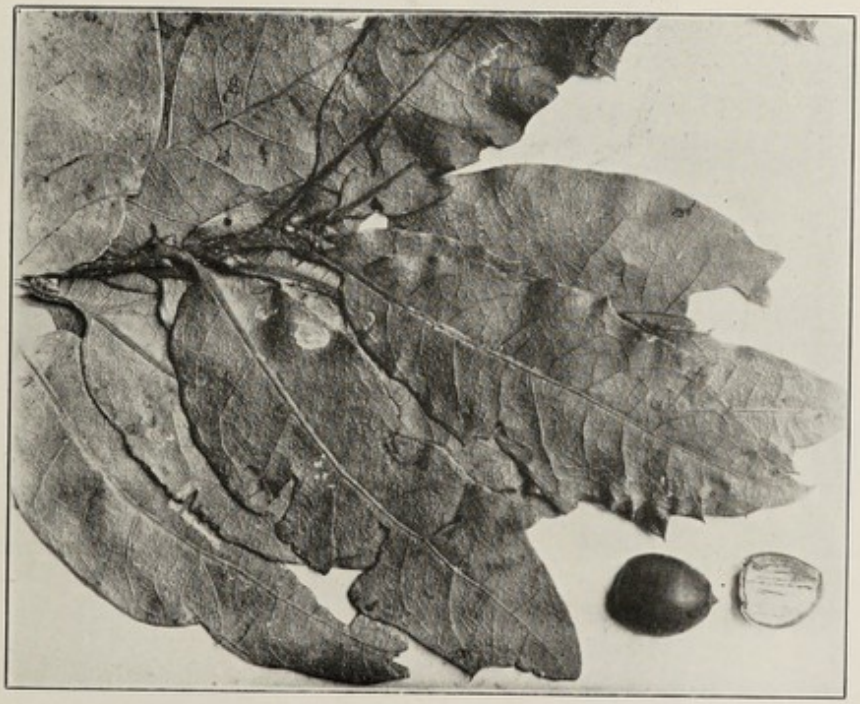
QUERCUS GHIESBREGHTII.

27837—24——21



QUERCUS GHIESBREGHTII.





QUERCUS ZEMPOALTEPECANA.



QUERCUS CUAJIMALPANA.

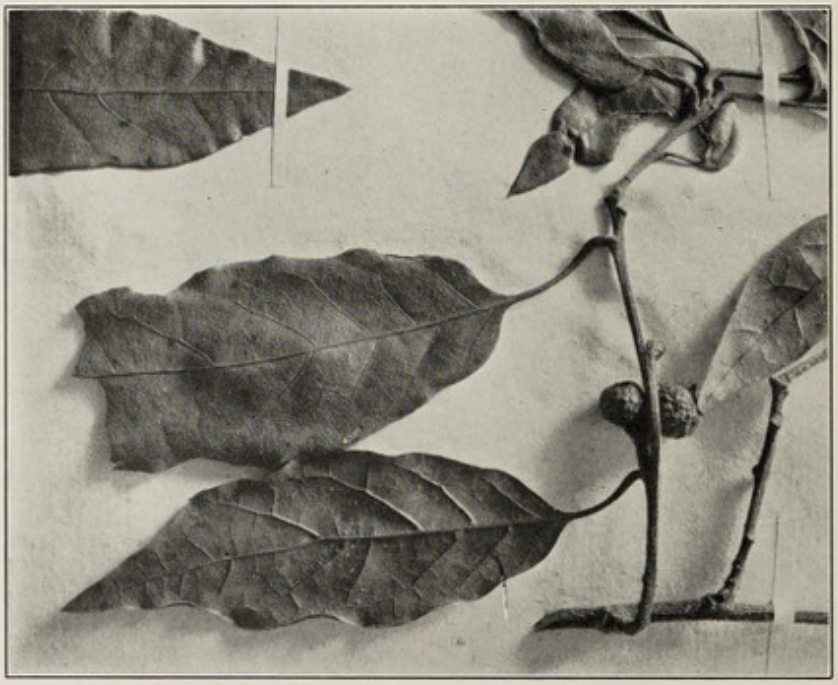


QUERCUS TLAPUXAHUENSIS.

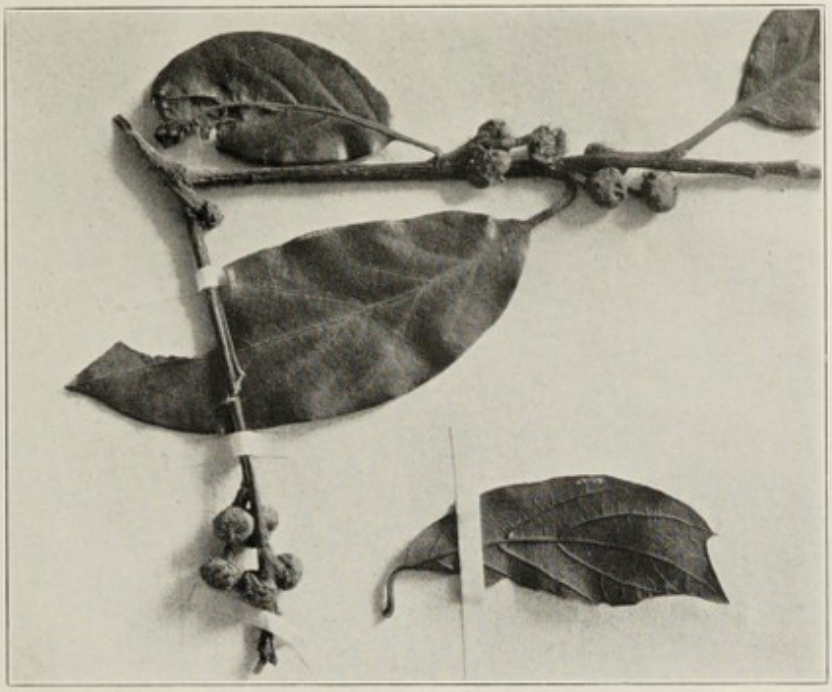


QUERCUS TLAPUXAHUENSIS OBCONICA.





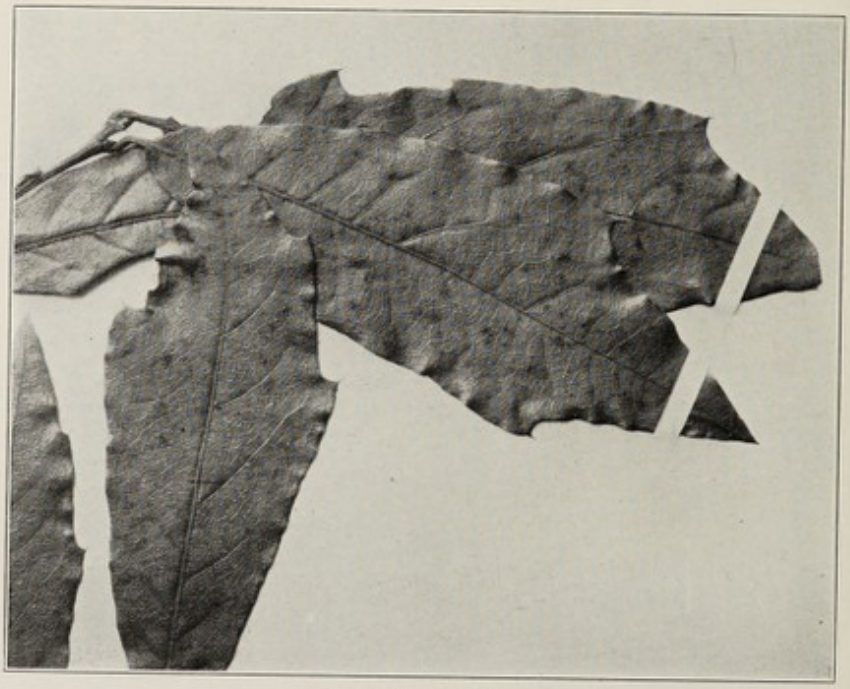
QUERCUS LANCEOLATA.





QUERCUS LAURINA.





QUERCUS LAURINA.



QUERCUS LAURINA.





QUERCUS MAJOR.





QUERCUS BARBINERVIS.



QUERCUS AFFINIS.

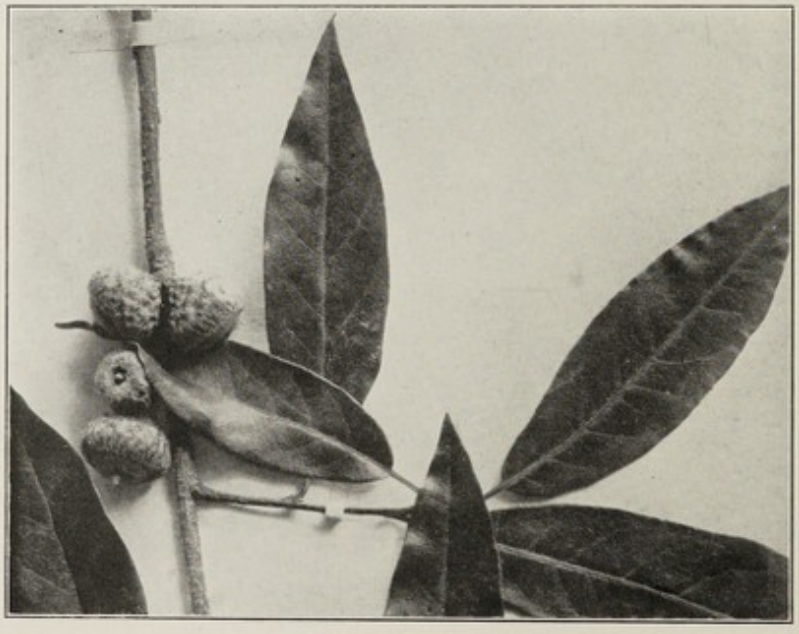


QUERCUS AFFINIS COMMUTATA.



QUERCUS AFFINIS SUBINTEGRA.





QUERCUS OCOTEAEFOLIA.



QUERCUS OCOTEAEFOLIA PODOCARPA.



QUERCUS OCOTEAEFOLIA CONFUSA.



QUERCUS BOURGAEI.



QUERCUS BOURGAEI ILICIFOLIA.



QUERCUS DEPRESSA.

27837—24——22



QUERCUS DEPRESSA.



QUERCUS SUBAVENIA.



QUERCUS SIDEROXYLA.



QUERCUS HYPOXANTHA.



QUERCUS CHRYSOPHYLLA.



QUERCUS TRIDENS.





QUERCUS TRISTIS.



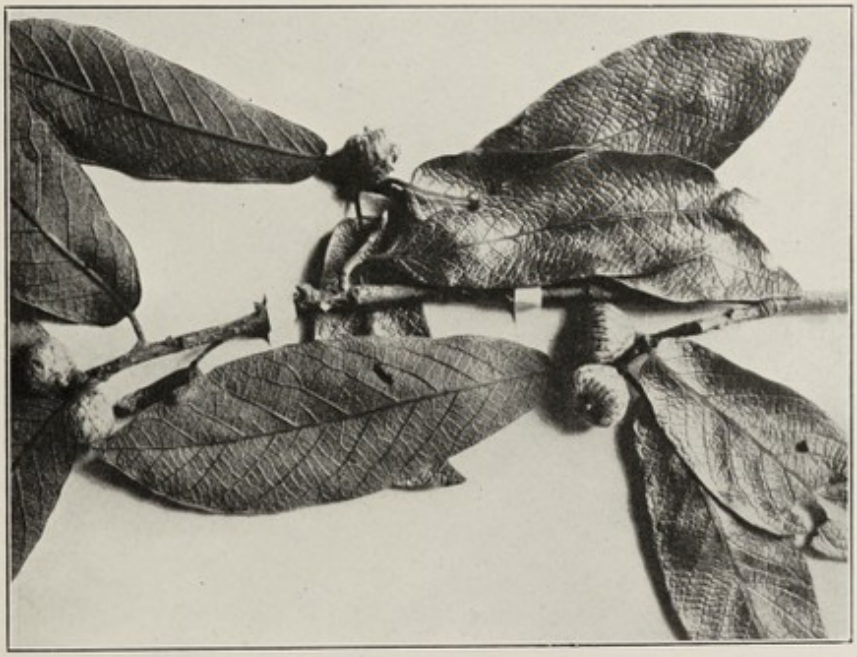
QUERCUS TRISTIS SUBLOBATA.



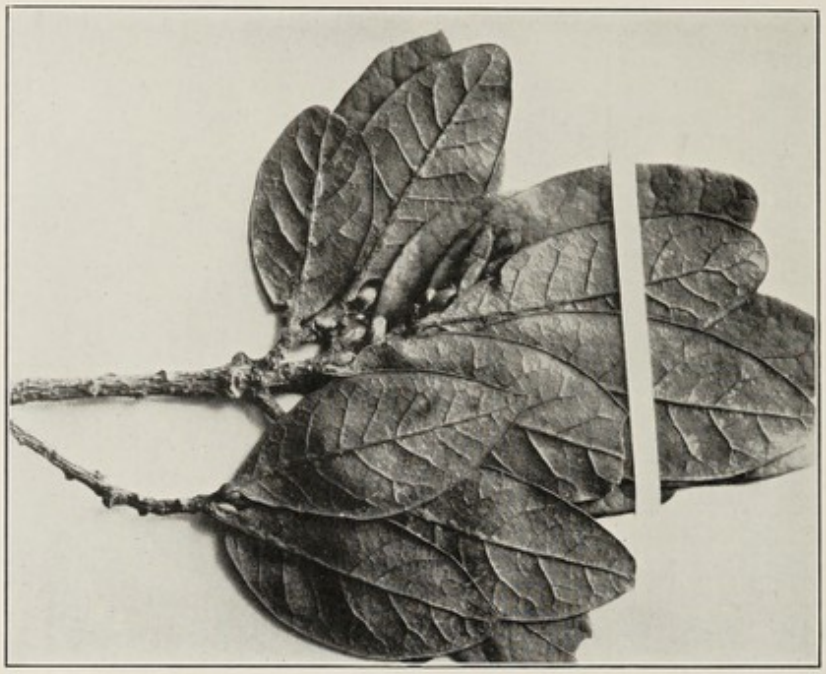
QUERCUS TRISTIS VULCANI.

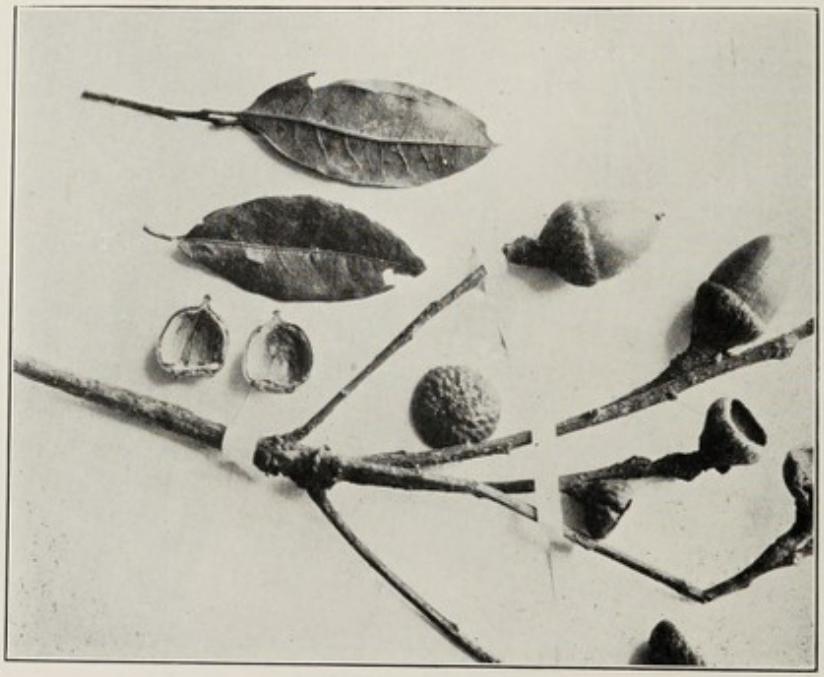


QUERCUS TRISTIS NIEDERLEINI.



QUERCUS SCHERZERI.

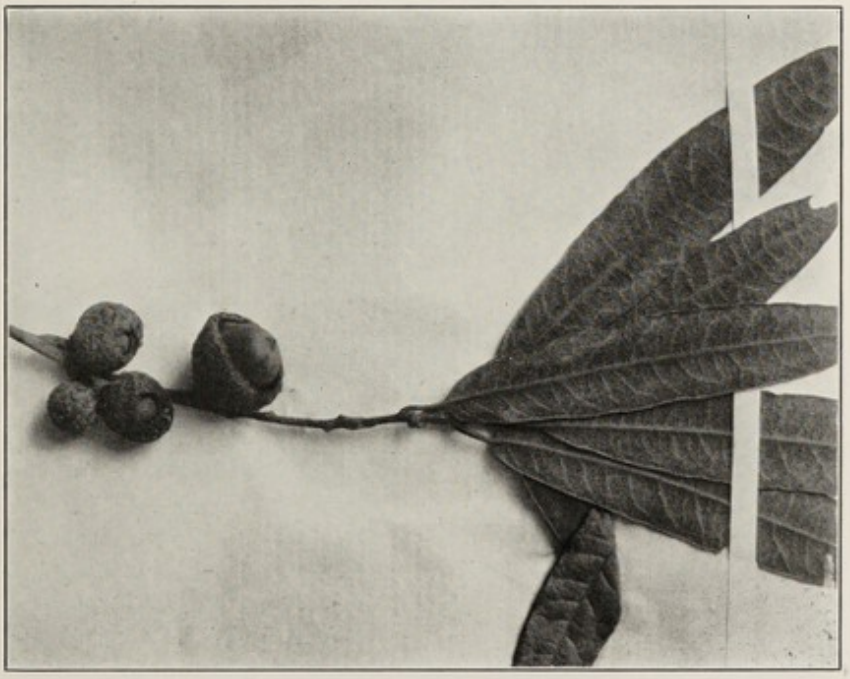




QUERCUS WESMAELI.



QUERCUS CONSOCIATA.



QUERCUS MEXICANA ANGUSTIFOLIA.





QUERCUS MEXICANA.



QUERCUS MEXICANA LANATA.



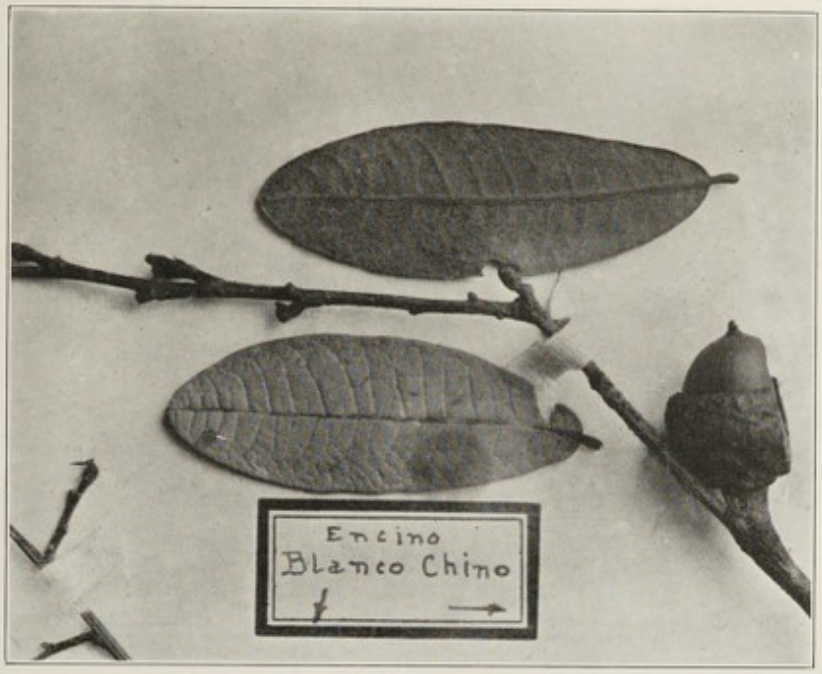
QUERCUS MEXICANA BONPLANDI.



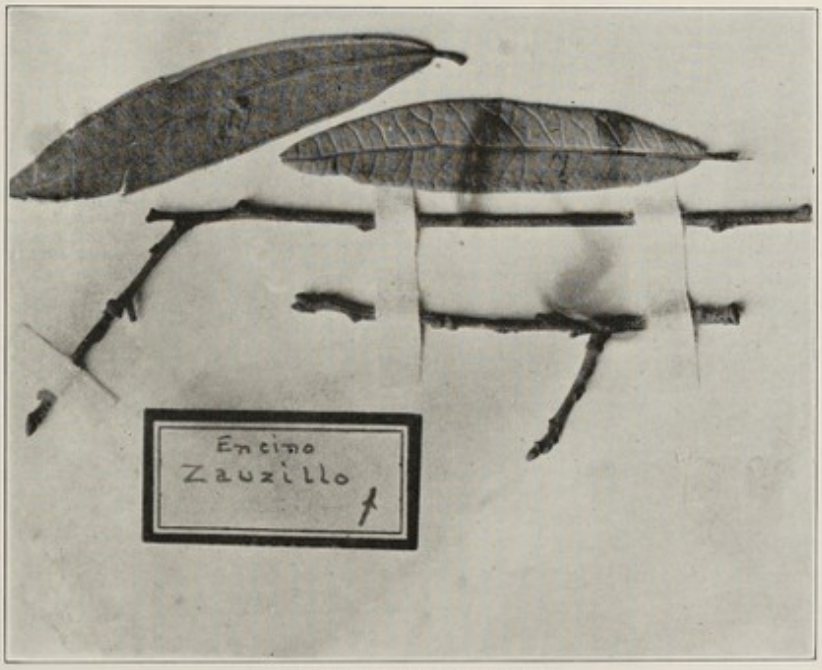
QUERCUS IMBRICARIAEFOLIA.



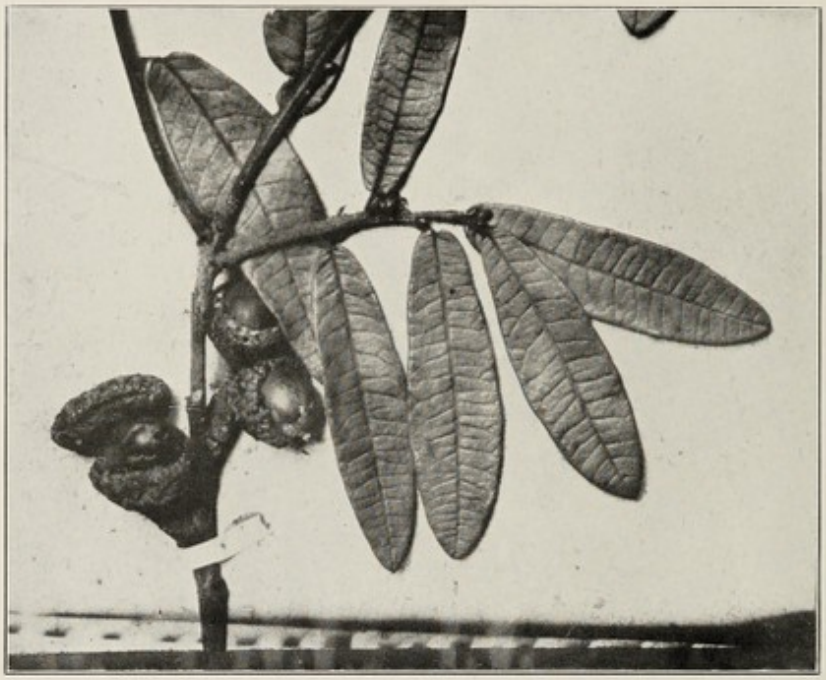
QUERCUS MALIFOLIA.



QUERCUS COLIMAE.



QUERCUS COLIMAE ZANZILLO.





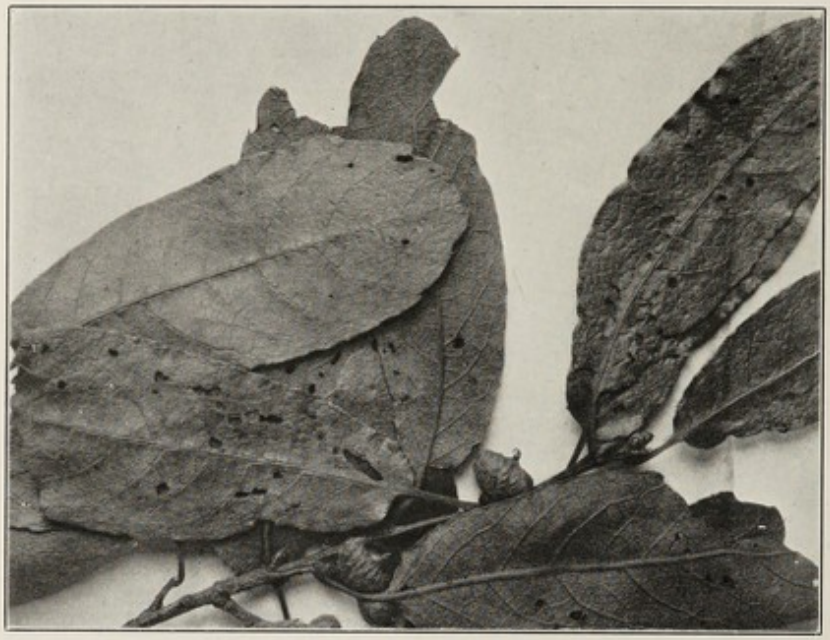
QUERCUS CRASSIPES.

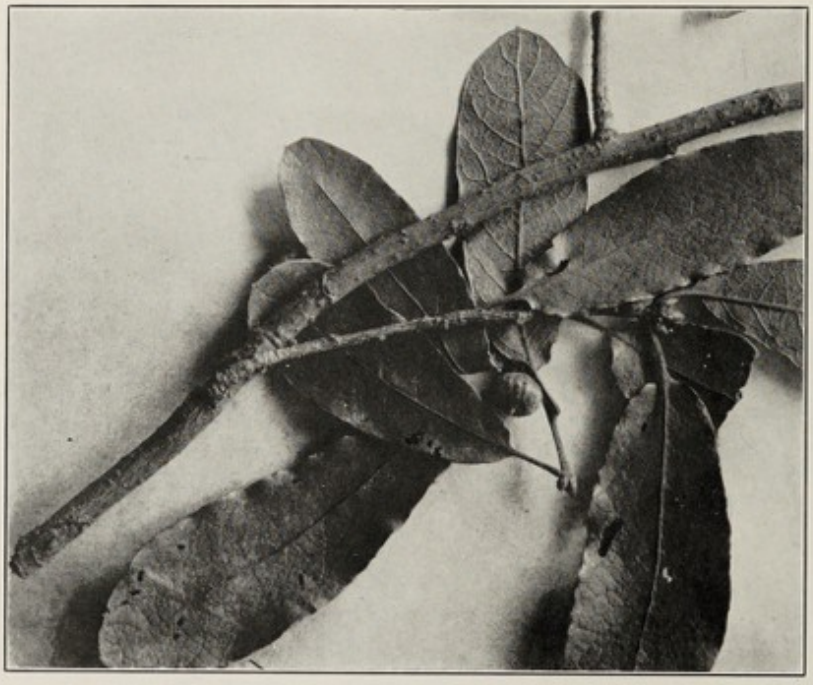


QUERCUS CRASSIPES.



QUERCUS OBOVALIFOLIA.





QUERCUS AXILLARIS.



QUERCUS SUBCRISPATA.

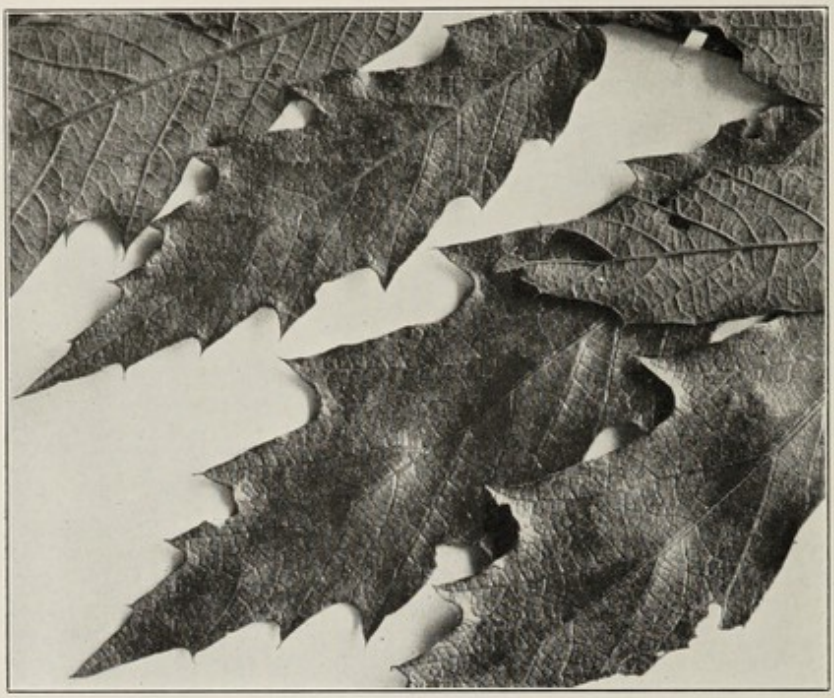
27837—24——23



QUERCUS LANIGERA.



QUERCUS LANIGERA SIDEROXYLOIDES.

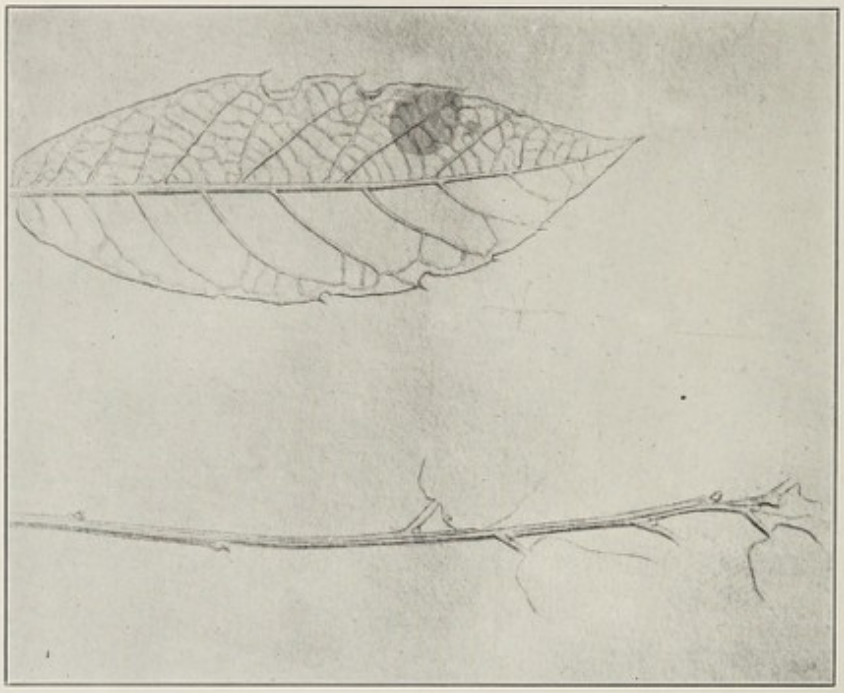




QUERCUS CIRCUMMONTANA.

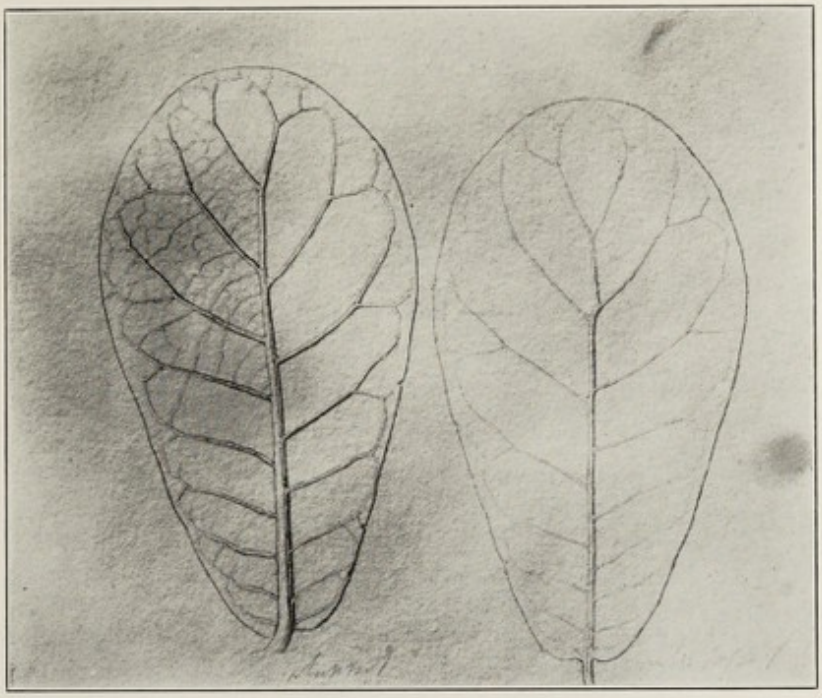


QUERCUS FOURNIERI.





QUERCUS CASTANEA.

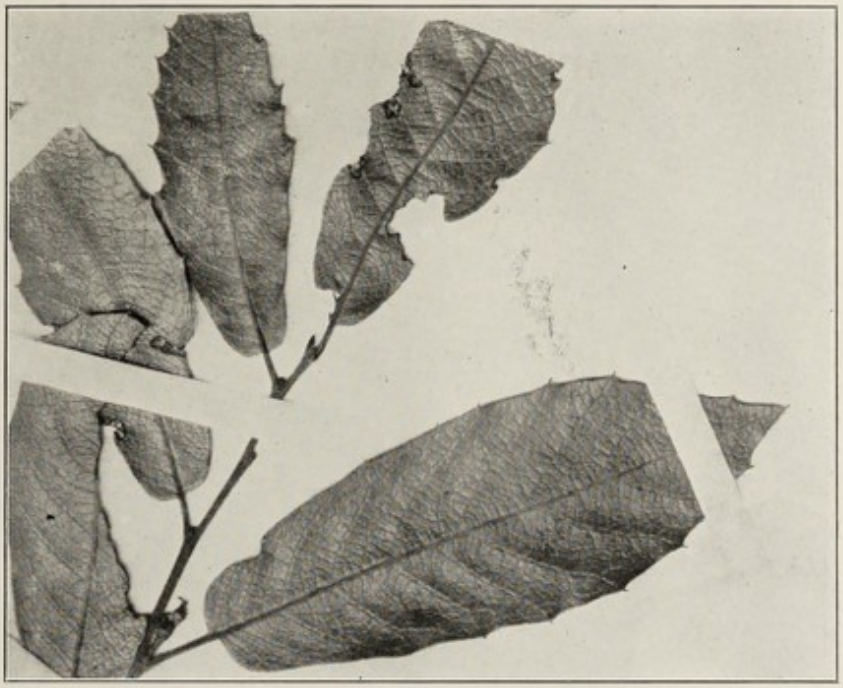




QUERCUS CASTANEA ELLIPTICA.



QUERCUS PULCHELLA.



QUERCUS SERRULATA.



QUERCUS ALAMOSENSIS.





QUERCUS ROSSII.



QUERCUS TEPOXUCHILENSIS.



QUERCUS SIMILLIMA.



QUERCUS IMPRESSA.



QUERCUS SELERI.



QUERCUS RUGULOSA.



QUERCUS ROSEOVENULOSA.

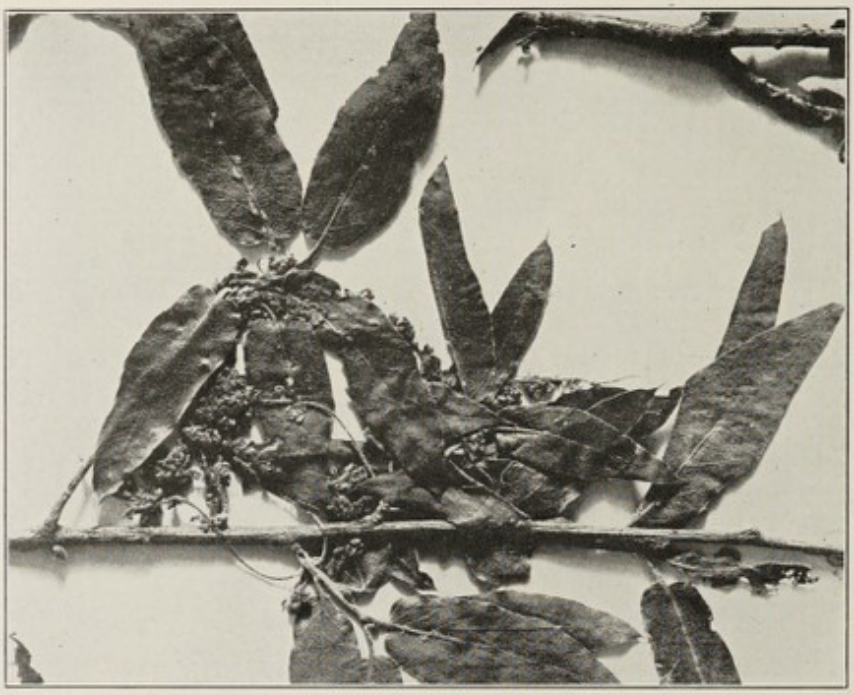


QUERCUS SIPURACA.



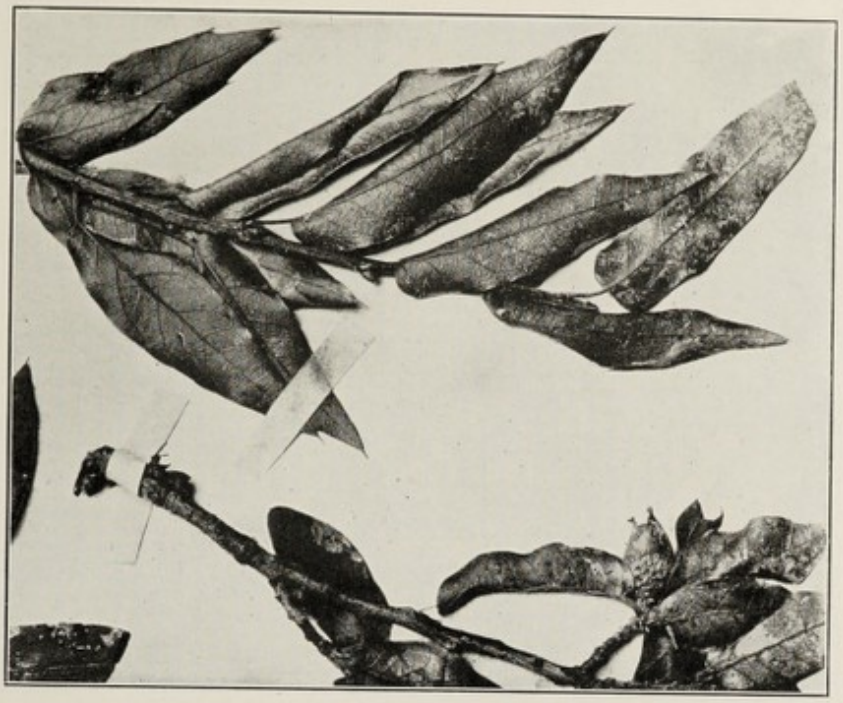


QUERCUS ACHERDOPHYLLA.





QUERCUS SALTILLENSIS.



QUERCUS SALTILLENSIS.



QUERCUS CARNEROSANA.

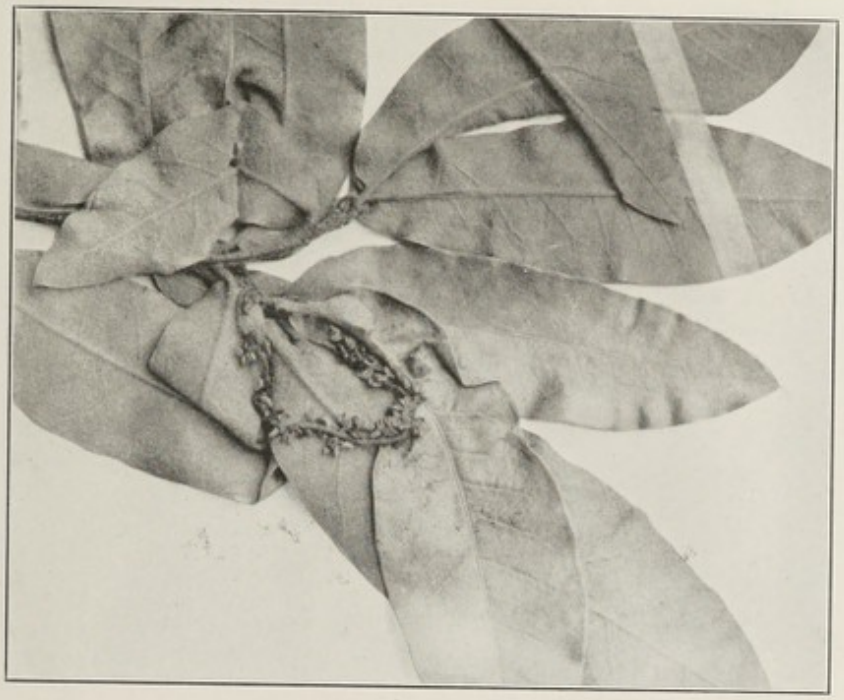
27837—24——24



QUERCUS CERIFERA.



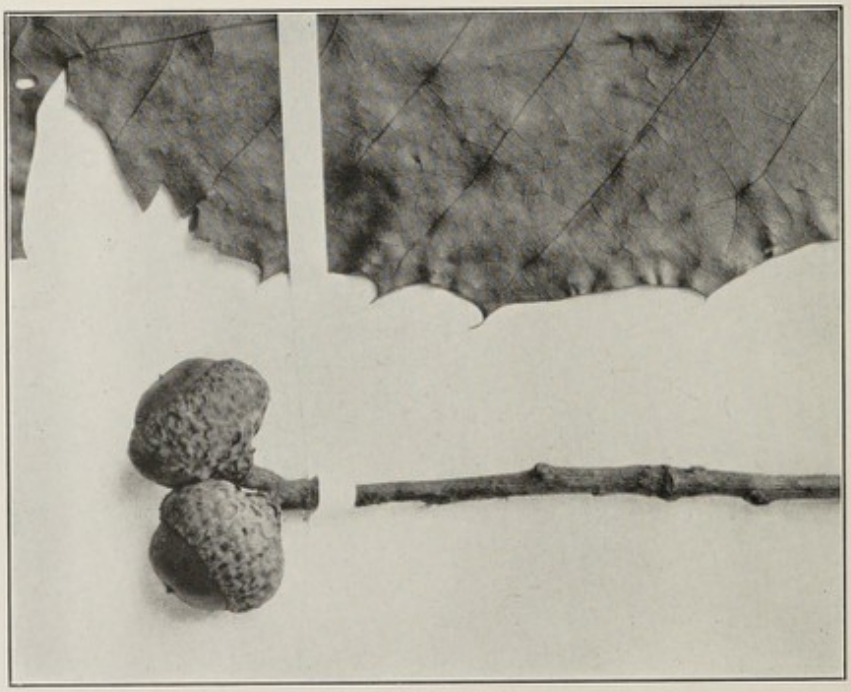
QUERCUS CRISPIPILIS.



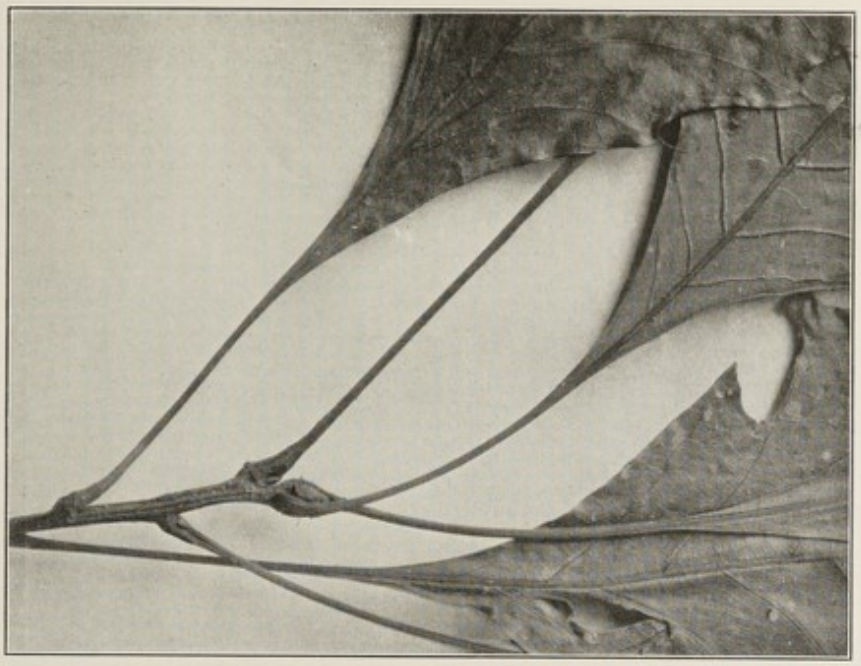


QUERCUS CINNAMOMEA.





QUERCUS GRANDIS.



QUERCUS GRANDIS TENUIPES.



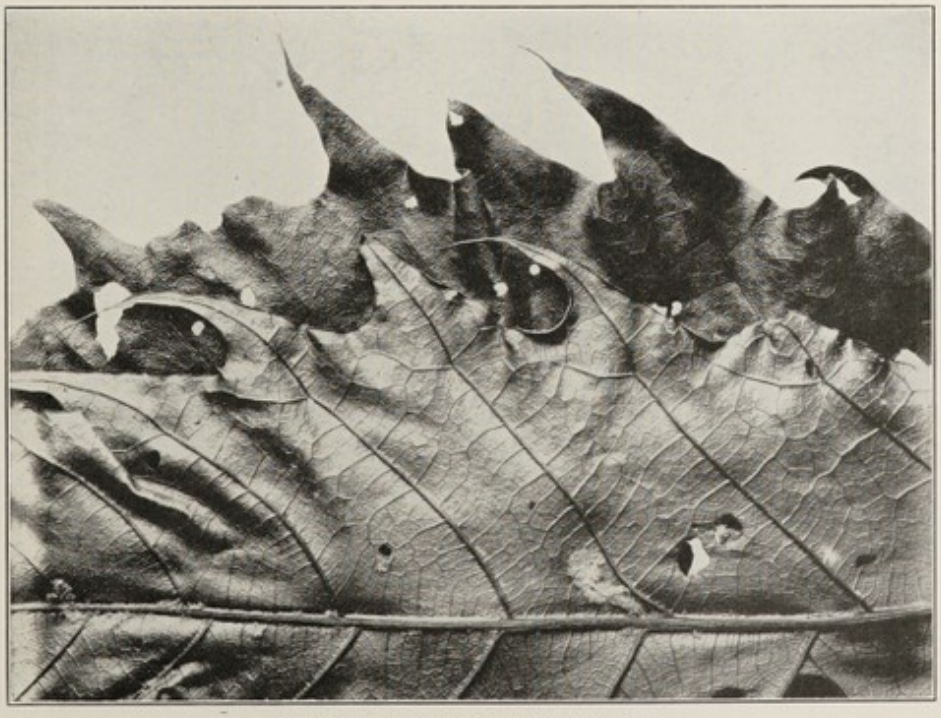
QUERCUS CORTESII.



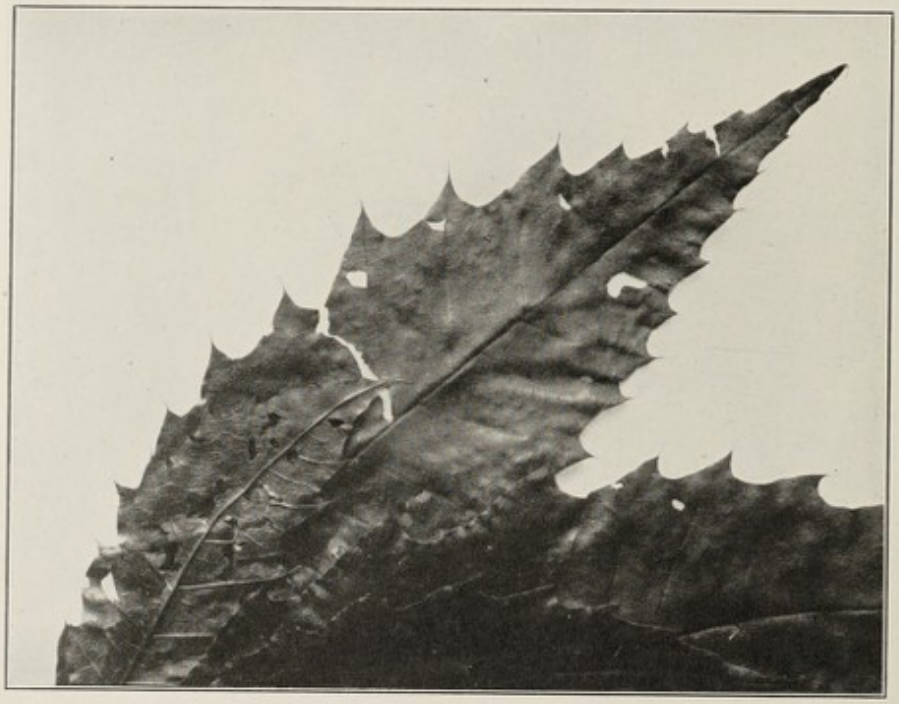


QUERCUS HUITAMALCANA.





QUERCUS CHIAPASENSIS FALCILOBATA.





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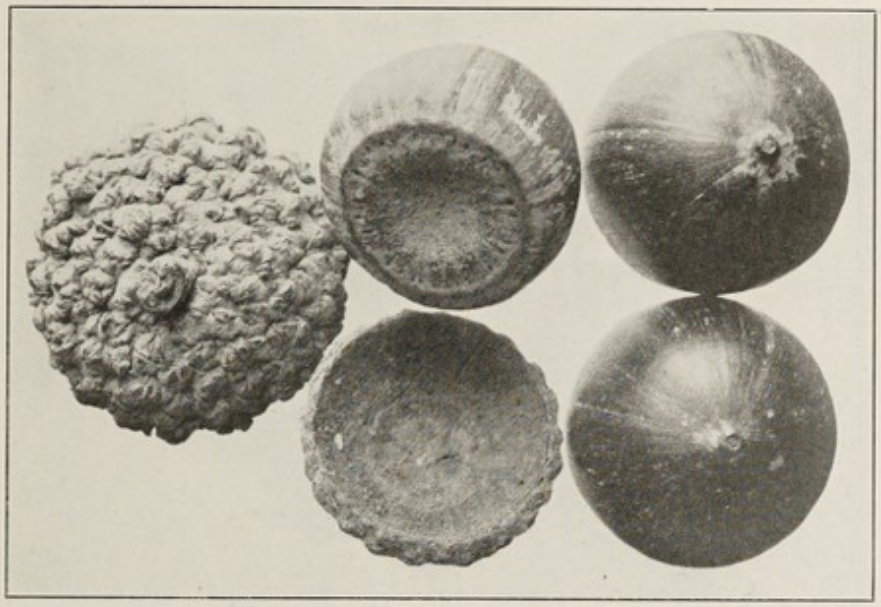
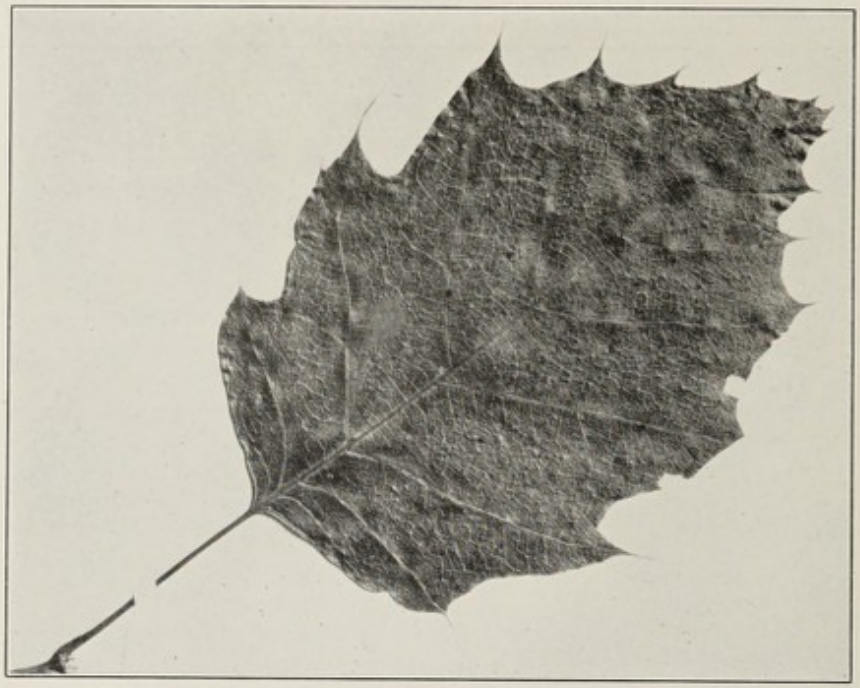
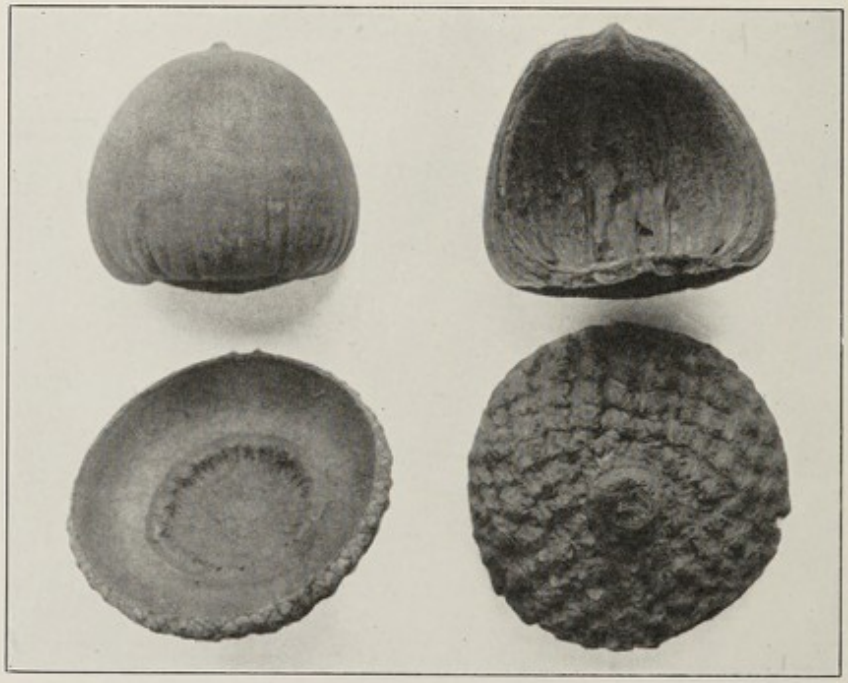


QUERCUS CHIAPASENSIS.

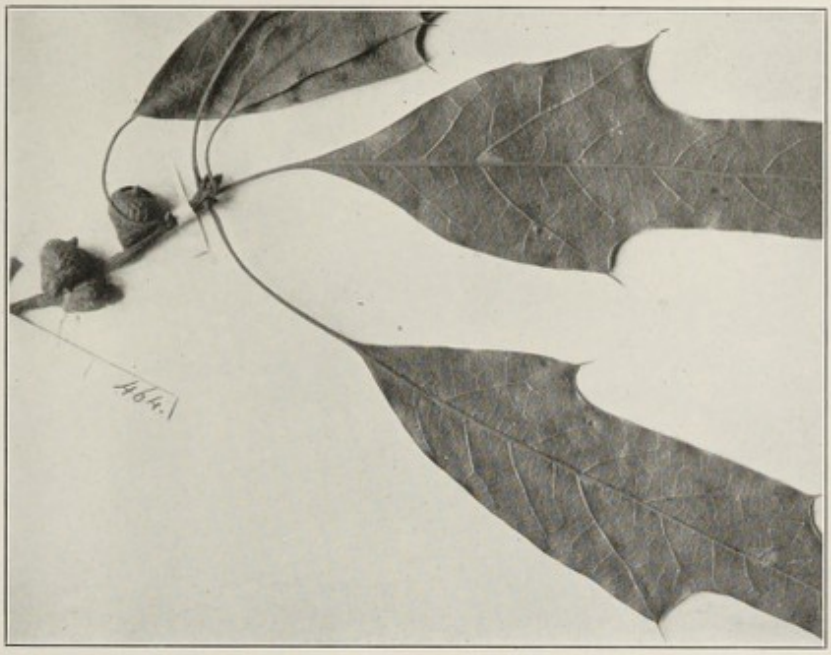


QUERCUS BRENESII.





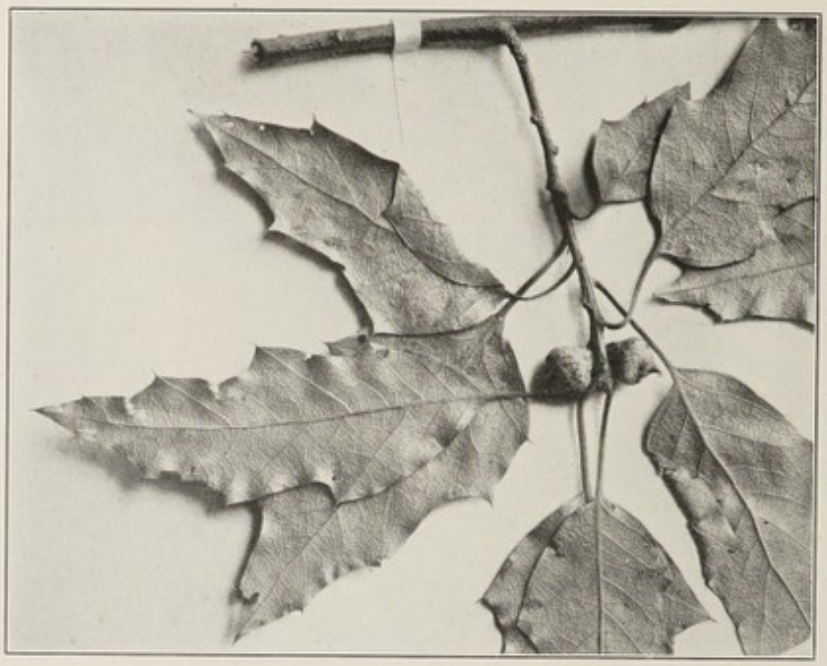
QUERCUS SKINNERI.



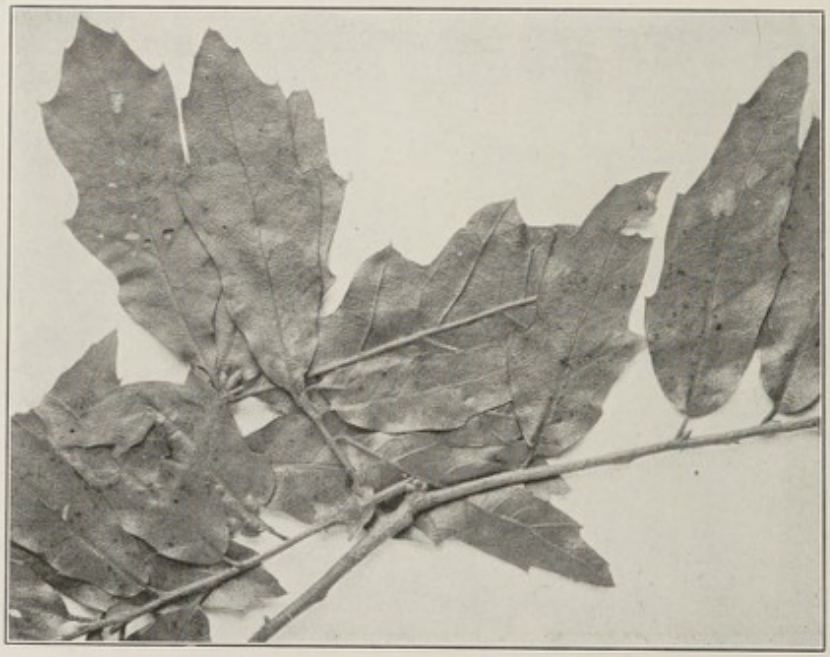
QUERCUS KARWINSKII.



QUERCUS CANBYI.



QUERCUS CANBYI ADSCENDENS.

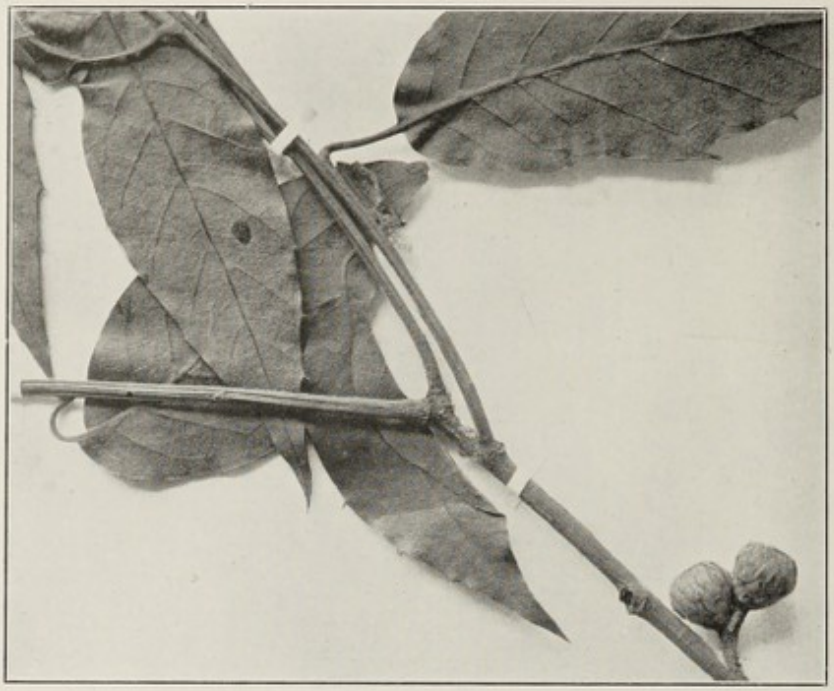


QUERCUS CANBYI BERLANDIERI.





QUERCUS SARTORII.



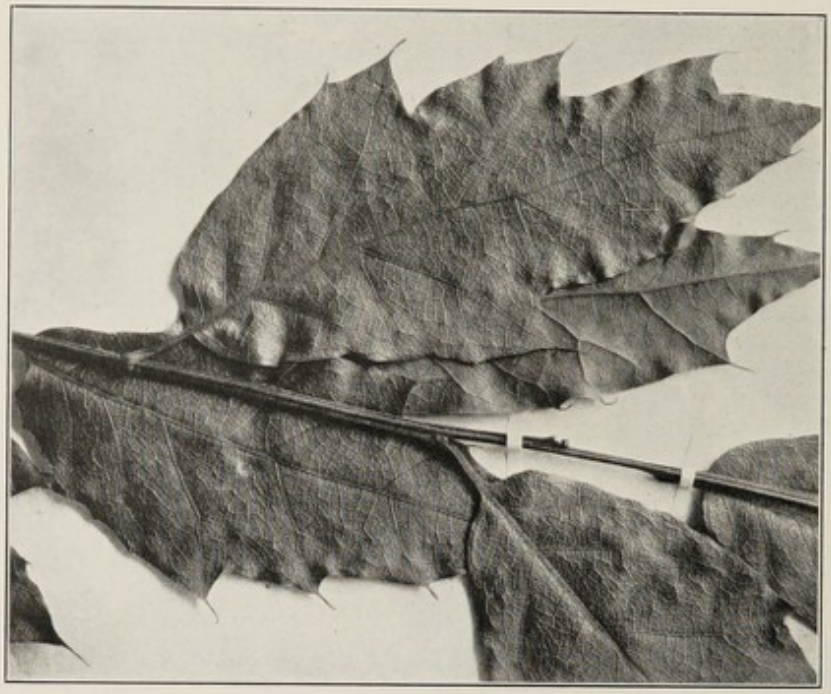


QUERCUS FURFURACEA.

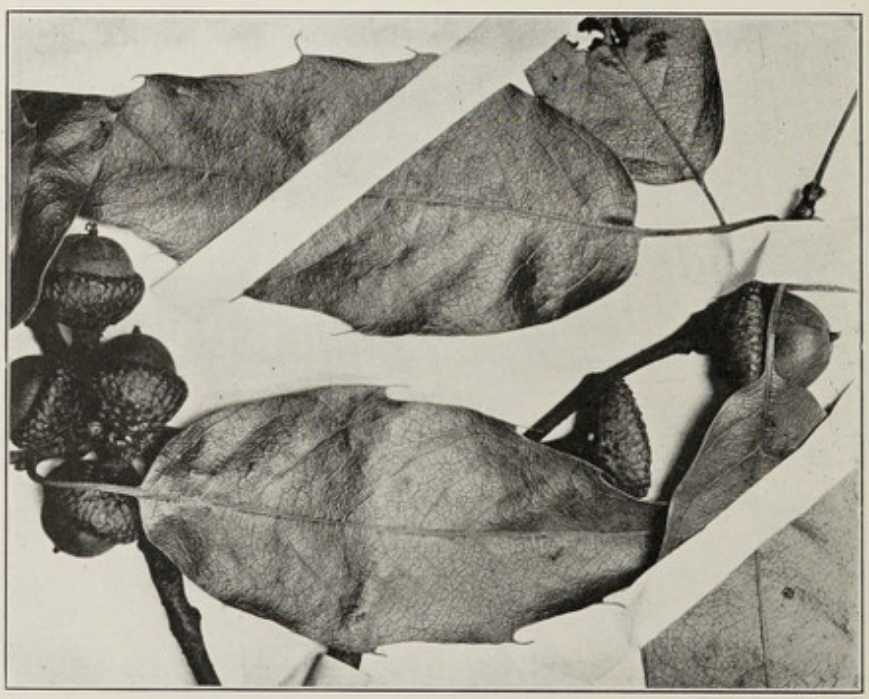




QUERCUS GRAHAMI.



QUERCUS GRAHAMI BREVIPES.



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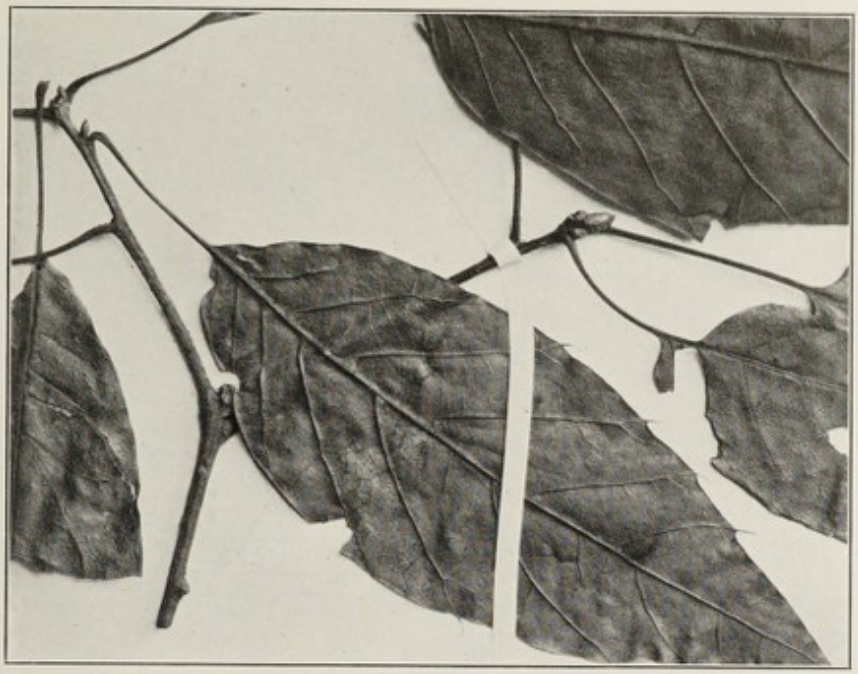
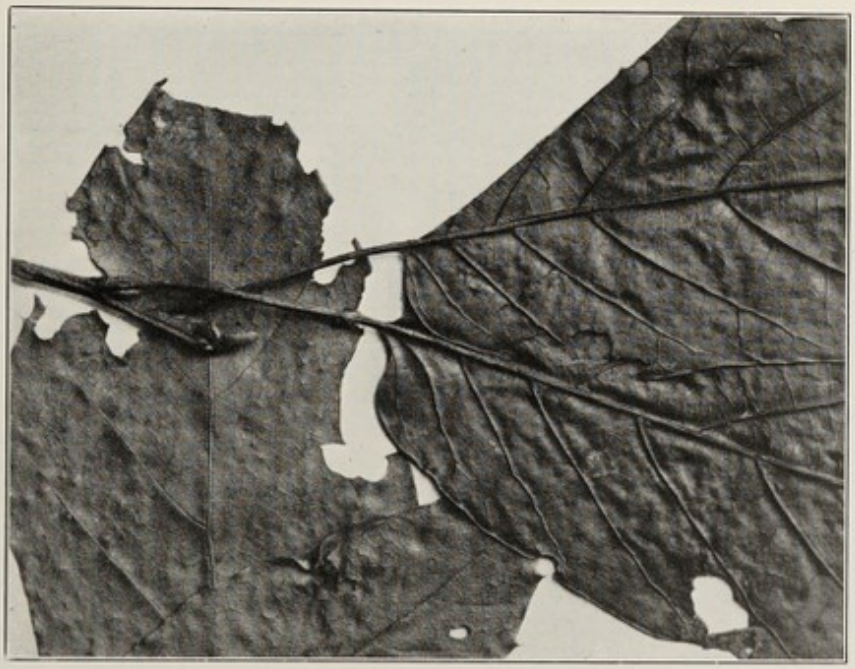
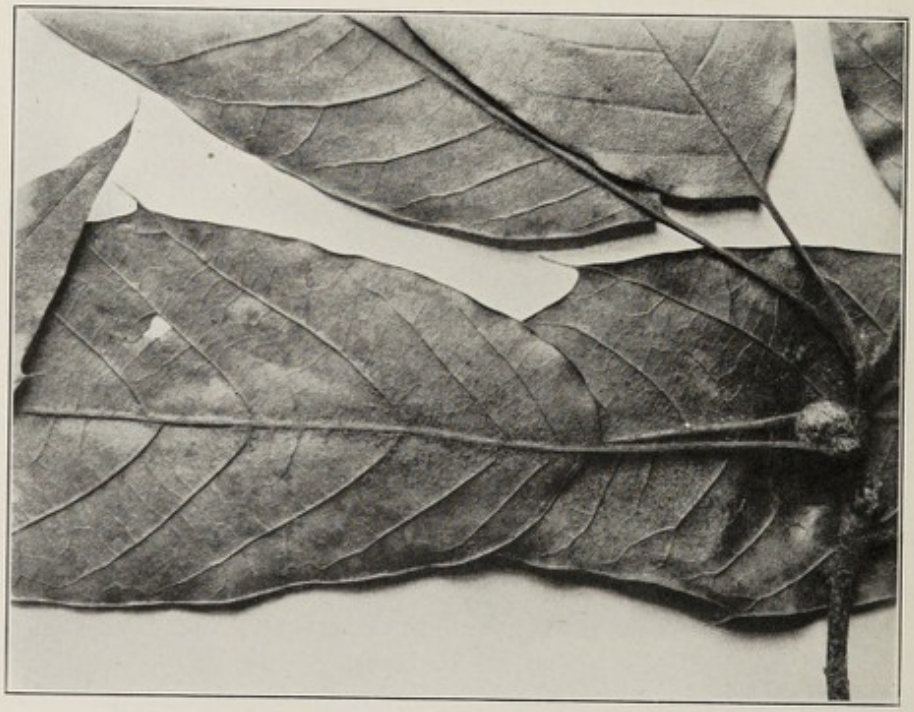




QUERCUS TONAGUIAE.

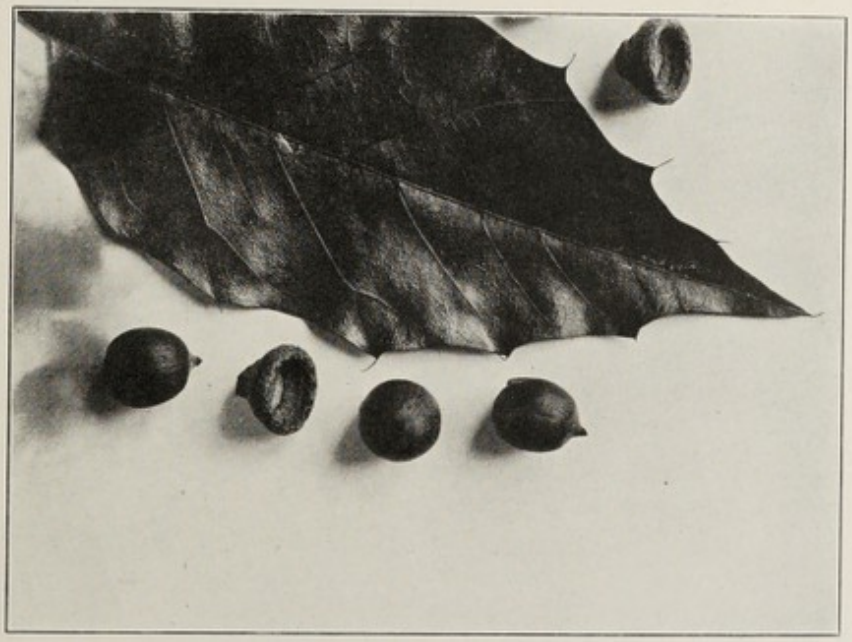
27837—24——25



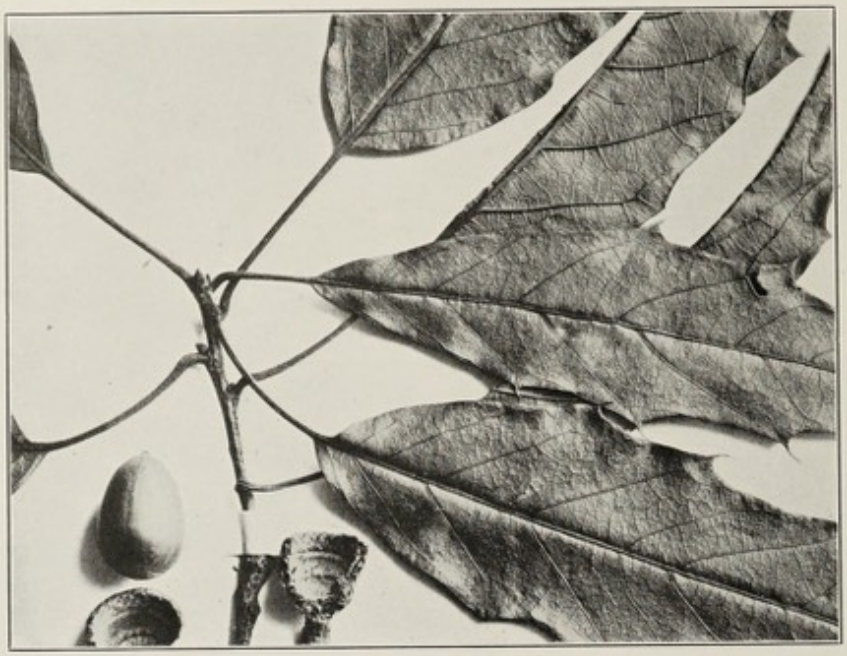


QUERCUS VEXANS.



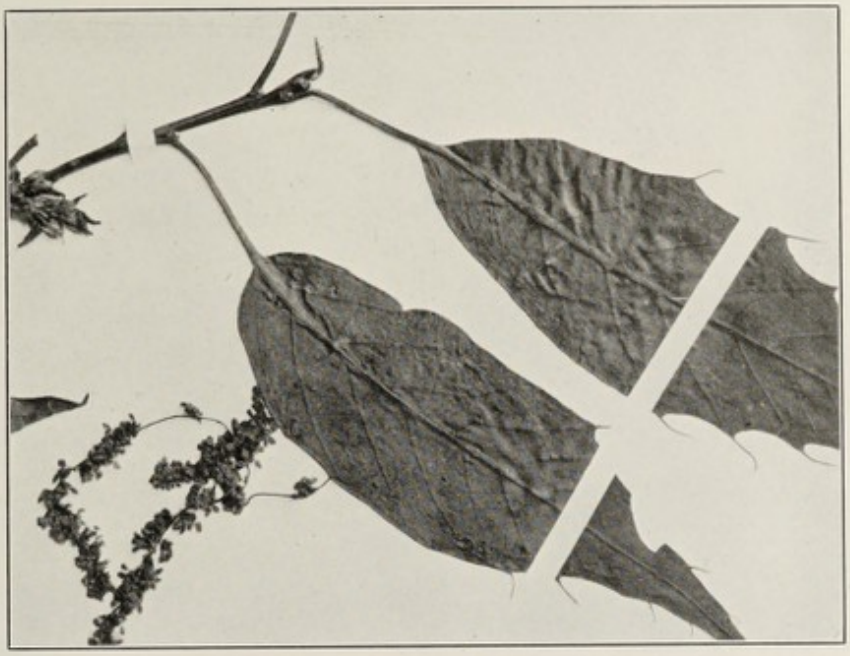


QUERCUS CANDOLLEANA.





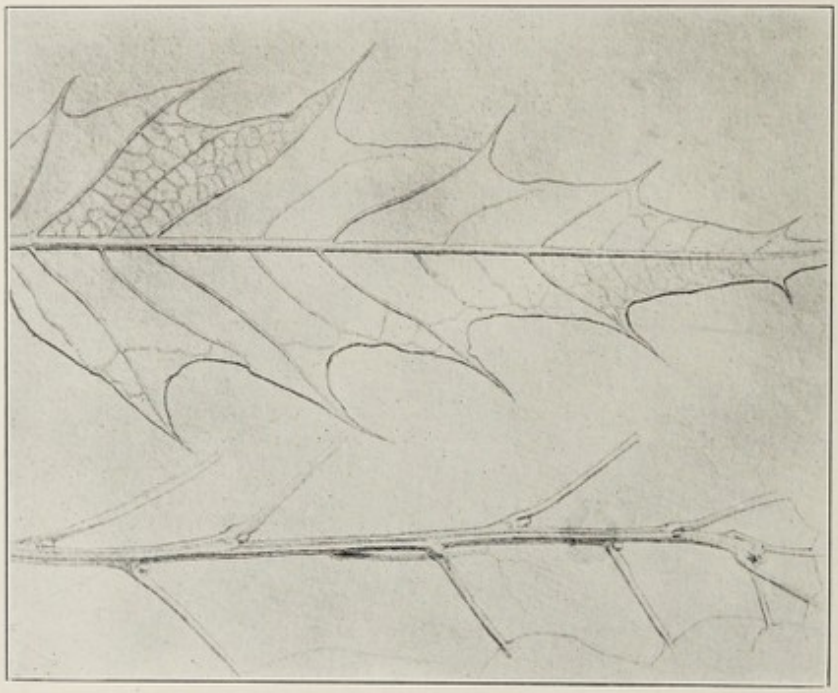
QUERCUS CONSPERSA.



QUERCUS CONSPERSA.



QUERCUS CONSPERSA OVATIFOLIA.





QUERCUS ACUTIFOLIA.

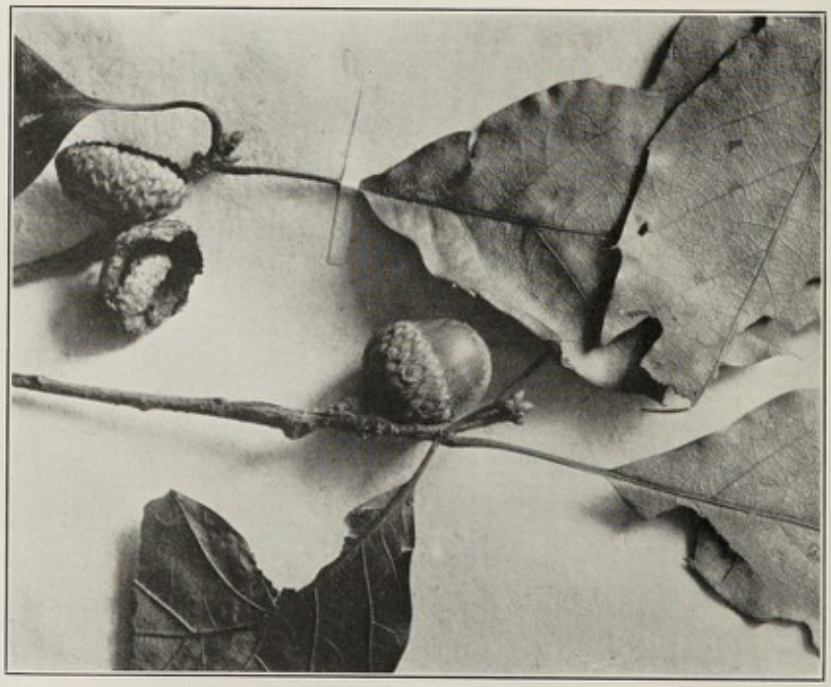


QUERCUS ACUTIFOLIA.



QUERCUS ACUTIFOLIA ANGUSTIFOLIA.





QUERCUS XALAPENSIS.

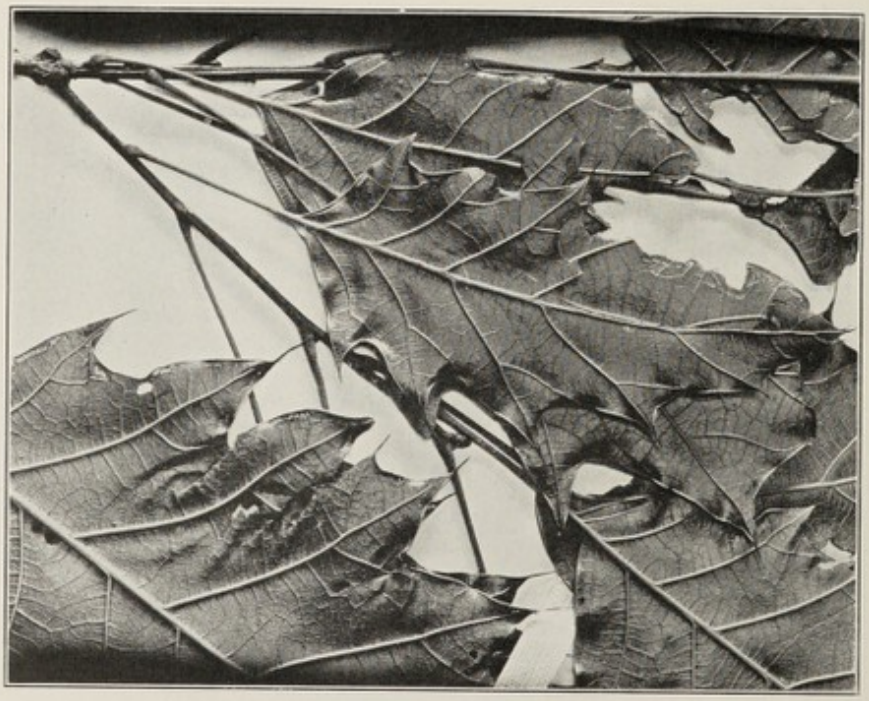


QUERCUS XALAPENSIS JALAPAE.

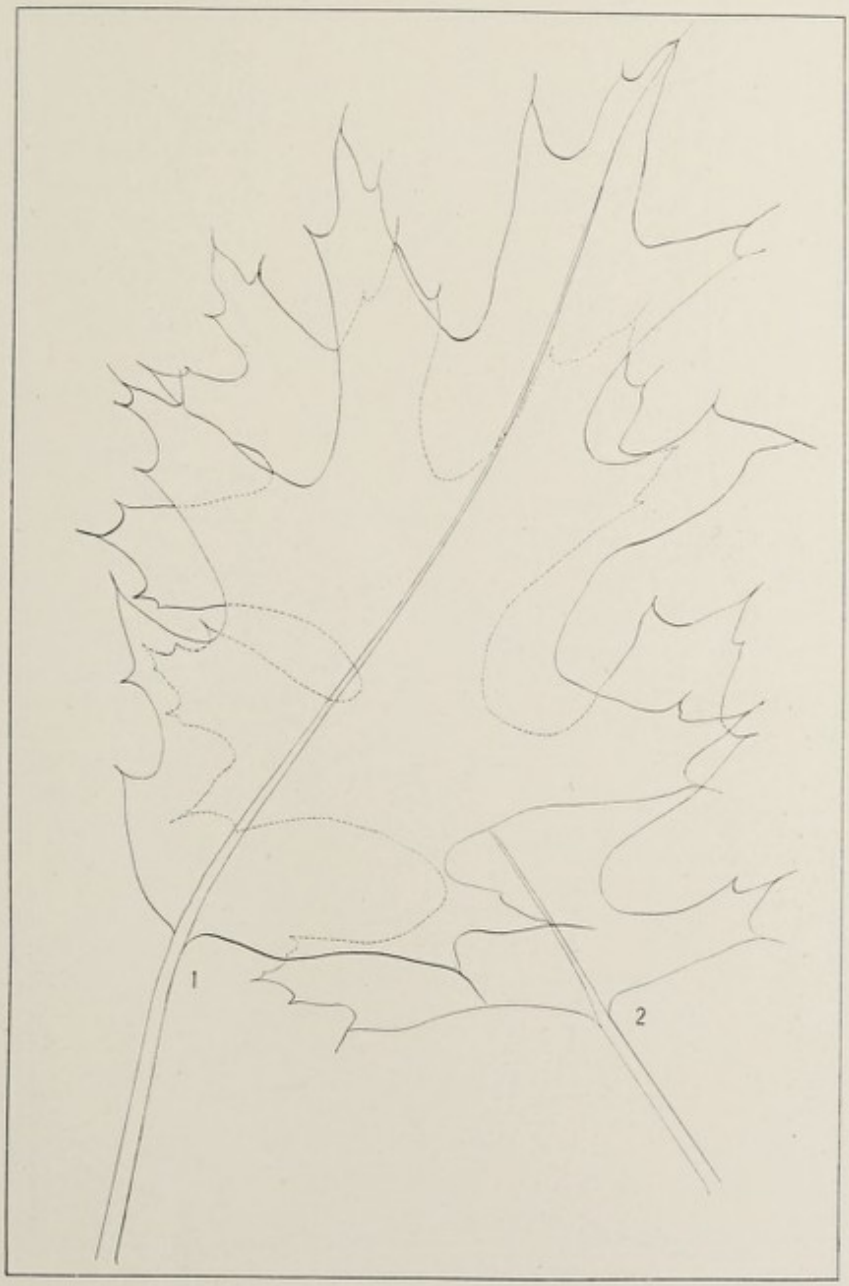


QUERCUS XALAPENSIS SURCULINA.



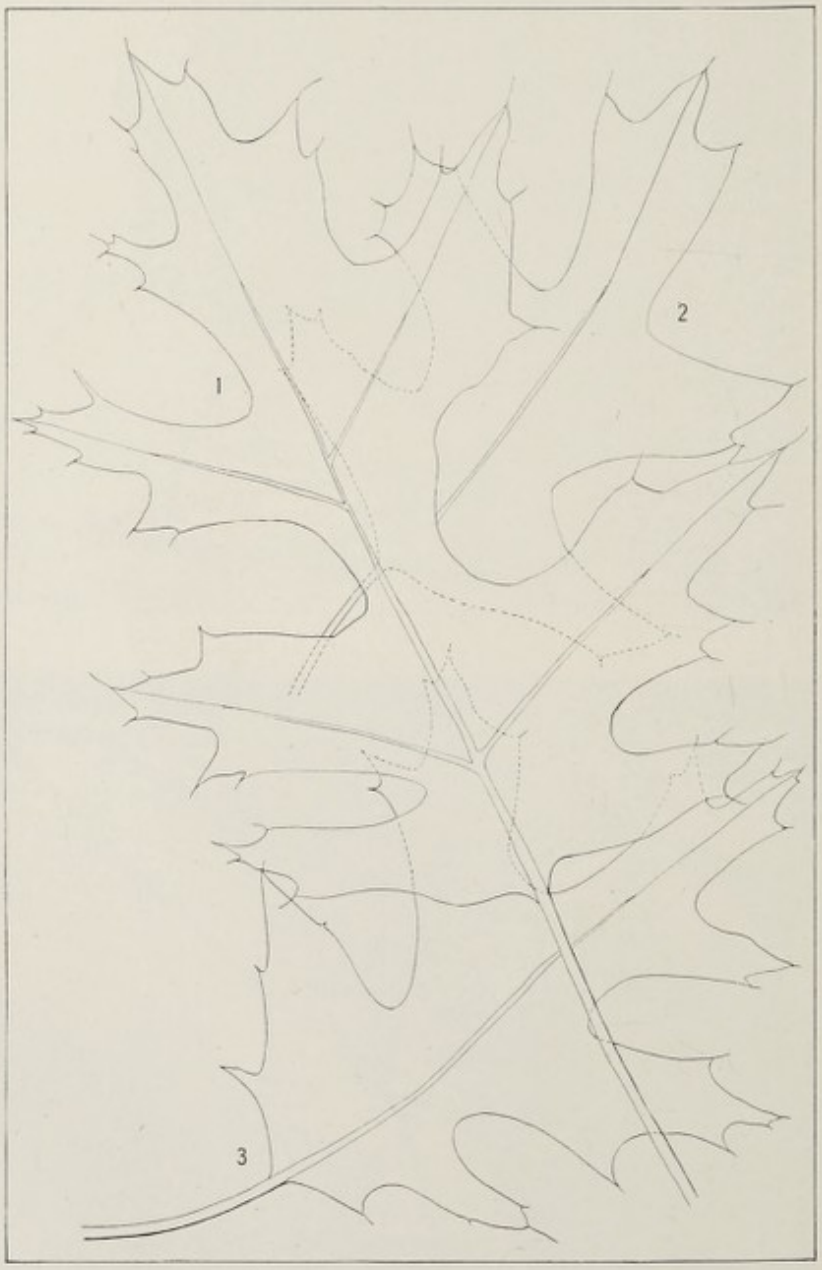


QUERCUS ALBOCINCTA.



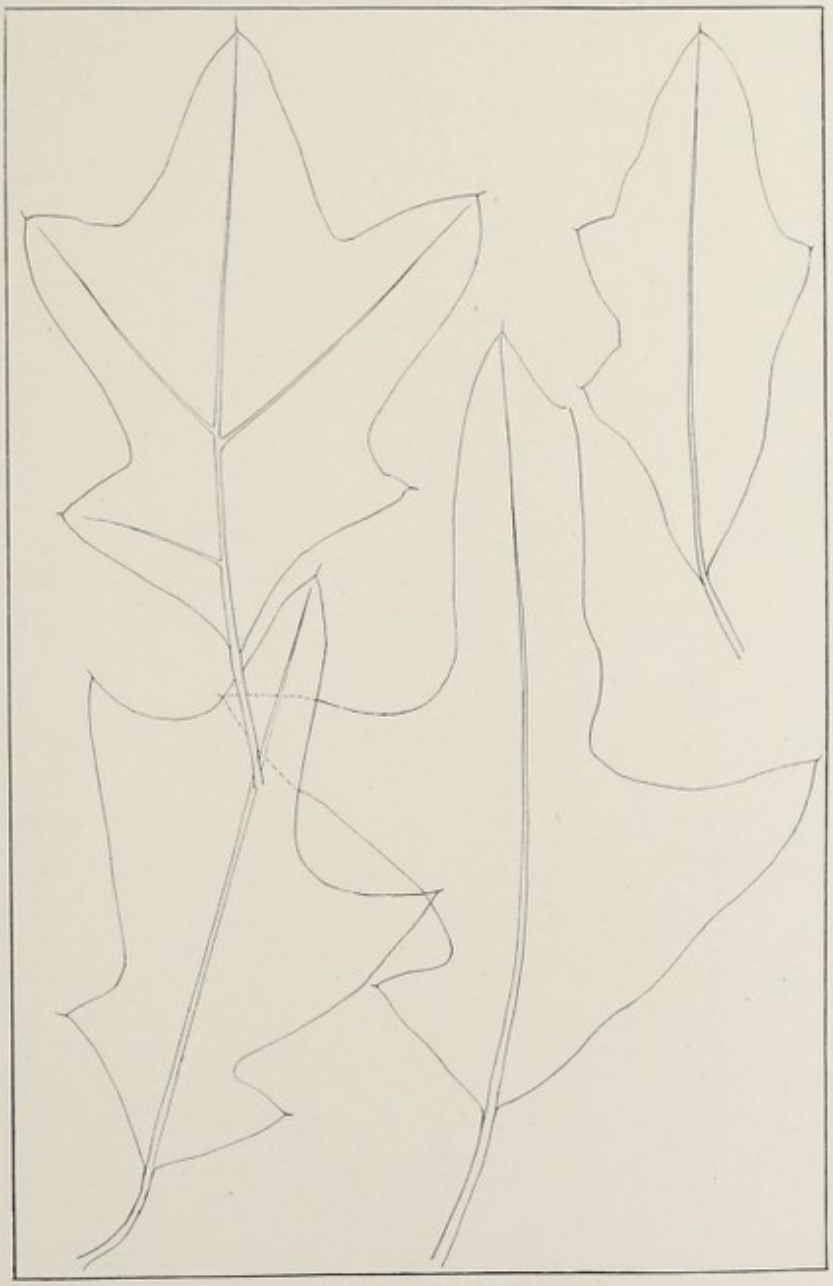
QUERCUS—THE COCCINEAE.

Q. maxima (1), Q. shumardii (2).

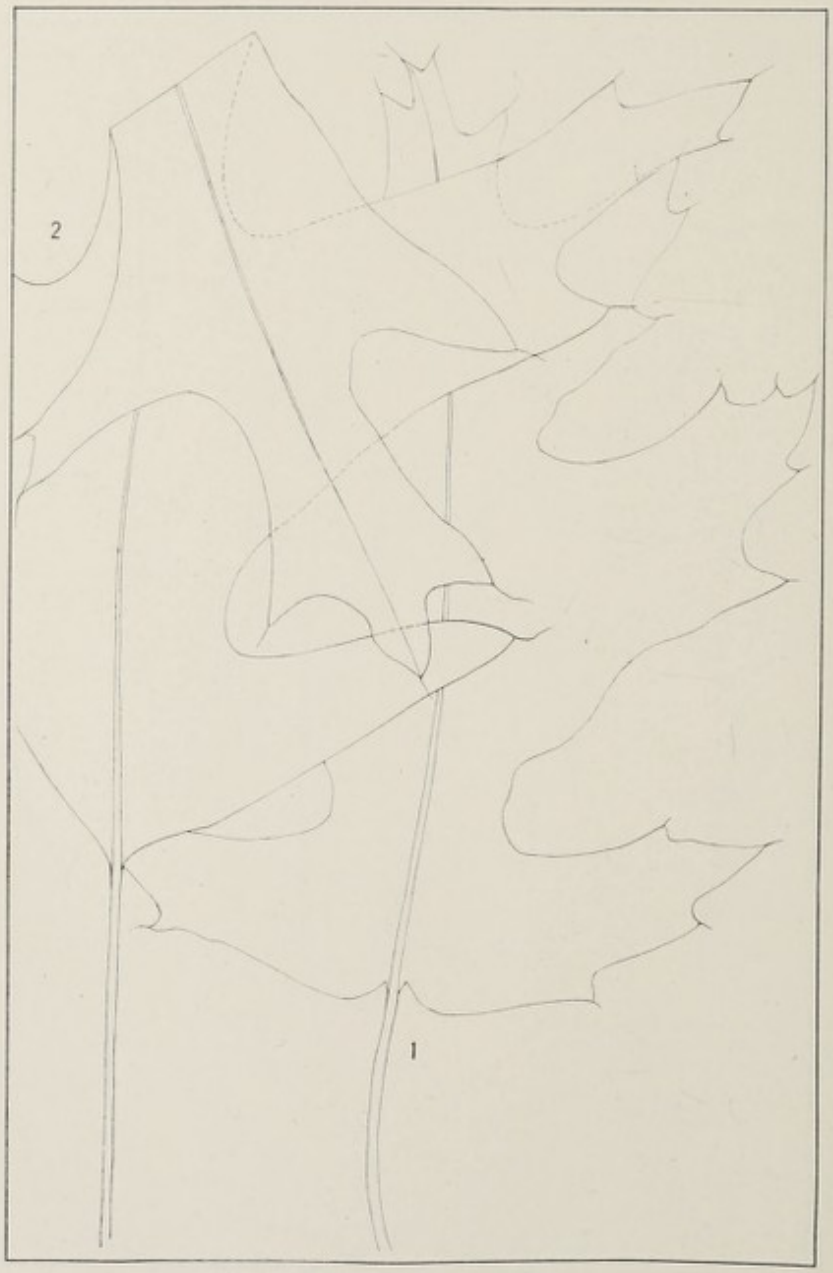


QUERCUS—THE COCCINEAE.

Q. coccinea (1), Q. texana (2), Q. ellipsoidalis (3).

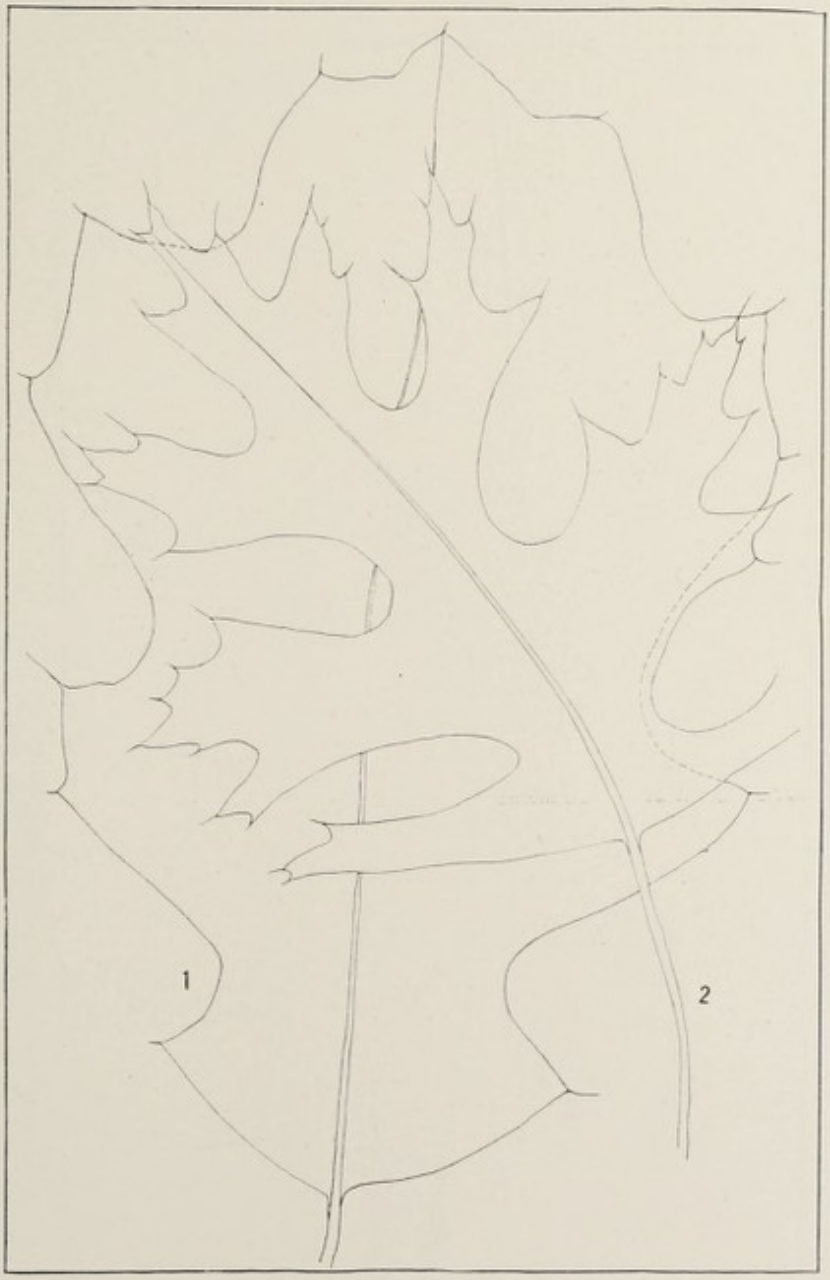


QUERCUS ILICIFOLIA.



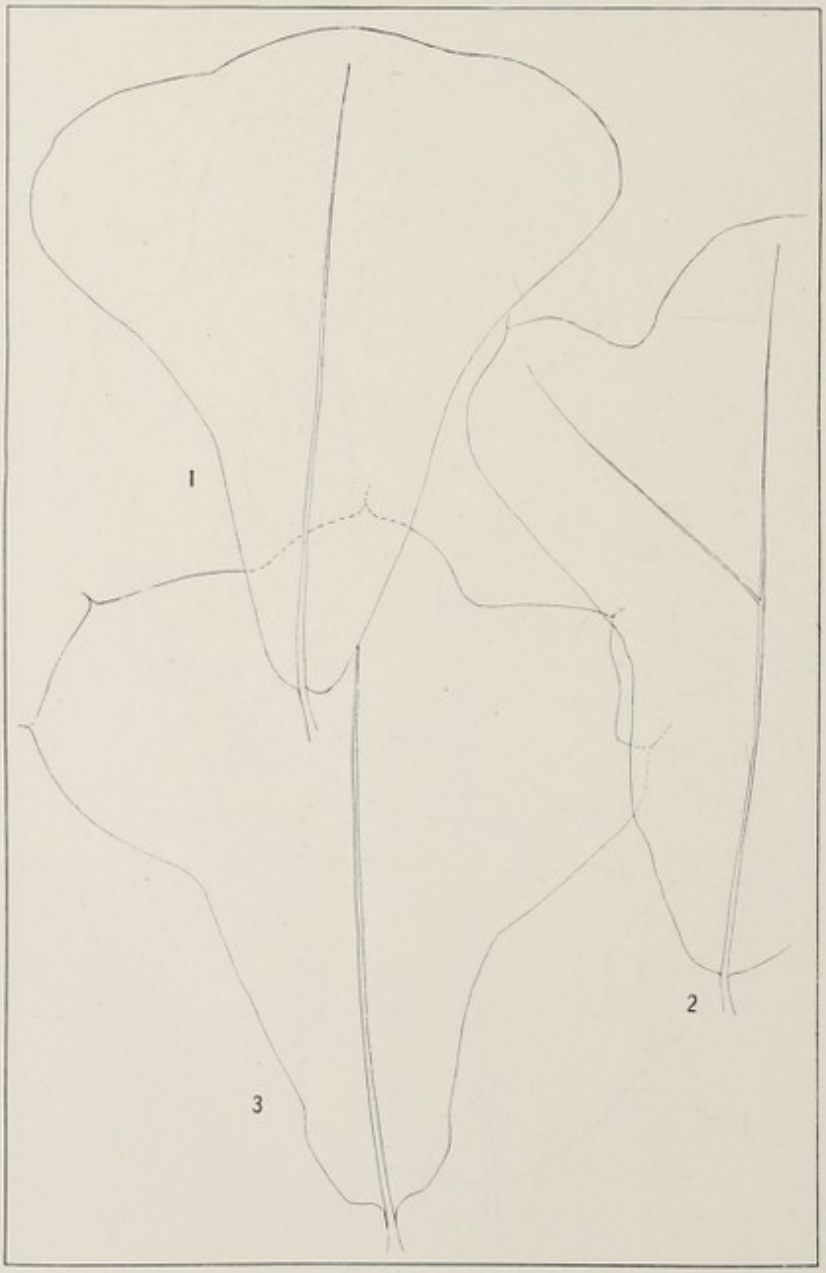
QUERCUS—THE VELUTINAE.

f. typica (1). f. pagodaeformis (2).



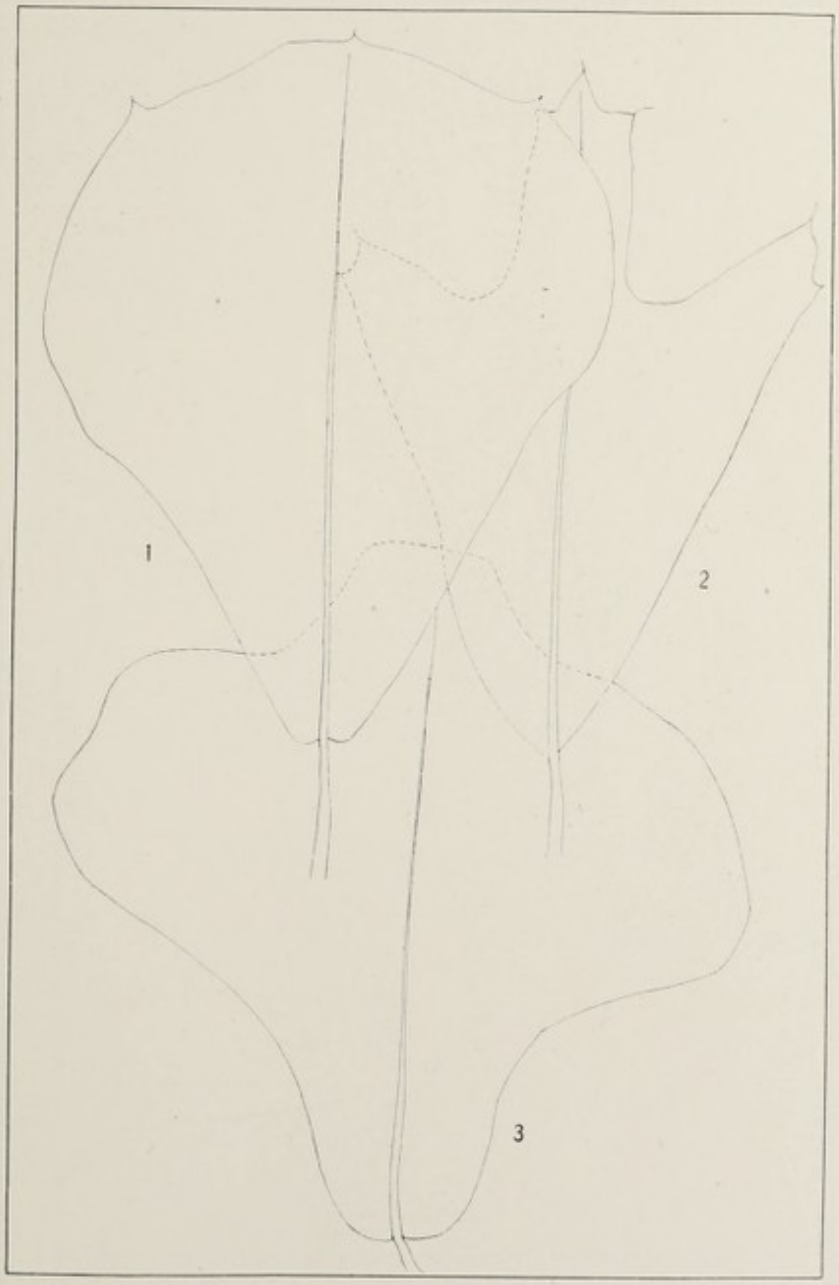
QUERCUS—THE VELUTINAE.

Q. velutina angulosa (1), f. dilaniata (2).



QUERCUS MARILANDICA.

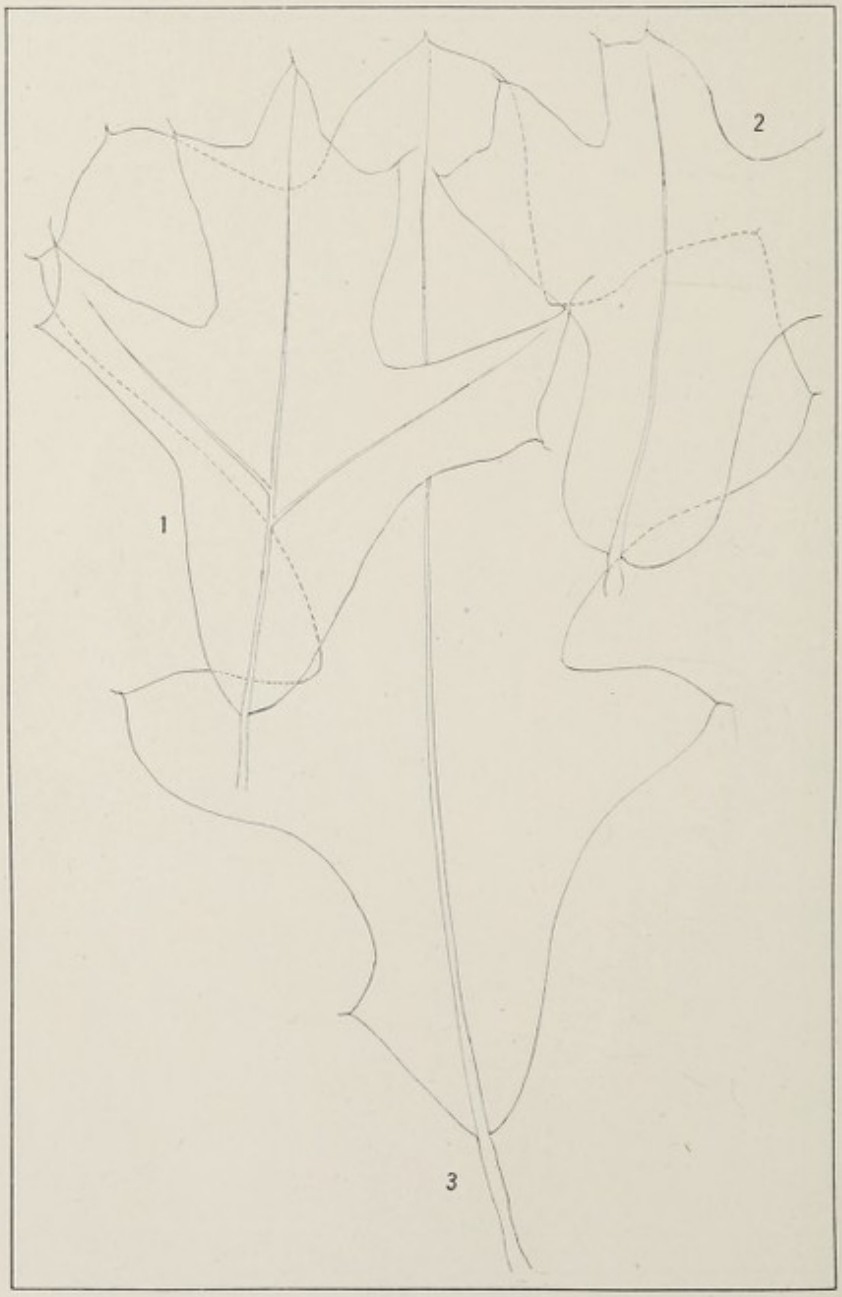
f. typica (1), f. aequilobata (2), f. paucidentata (3).



QUERCUS MARILANDICA.

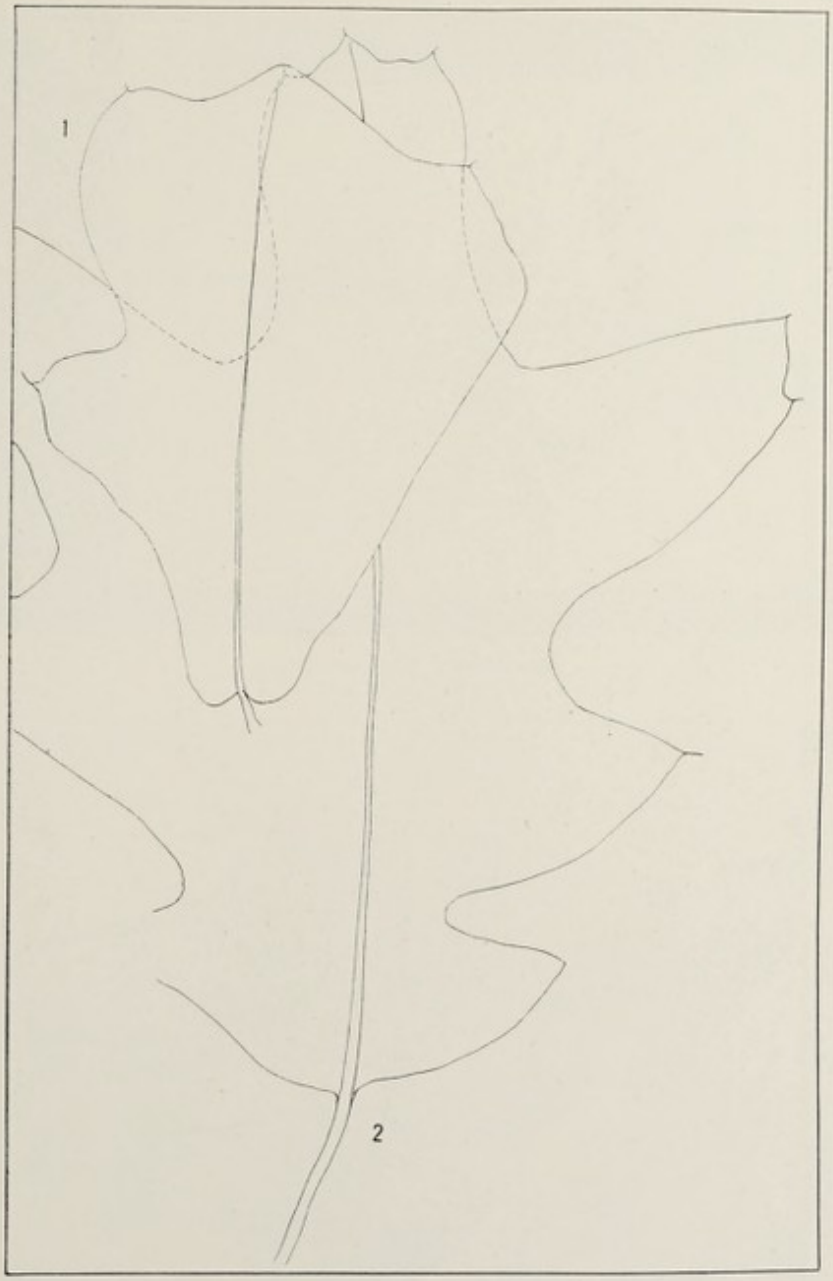
f. subtypica (1), f. cuneata (2), f. obovata (3).

27837—24——26



QUERCUS MARILANDICA.

f. incisa (1), f. truncata (2), f. sublyrata (3).

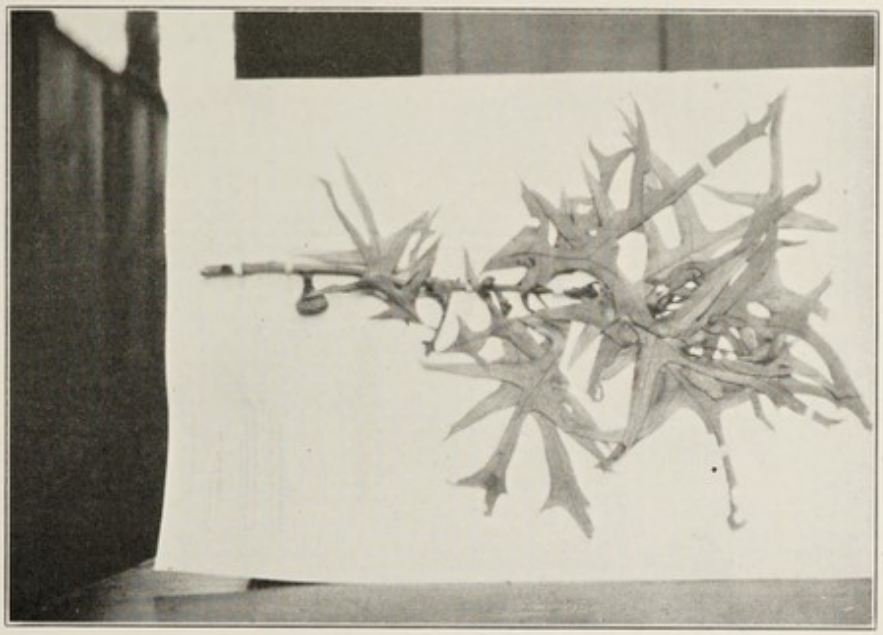


QUERCUS MARILANDICA.

f. subquinqueloba (1), f. quinqueloba (2).



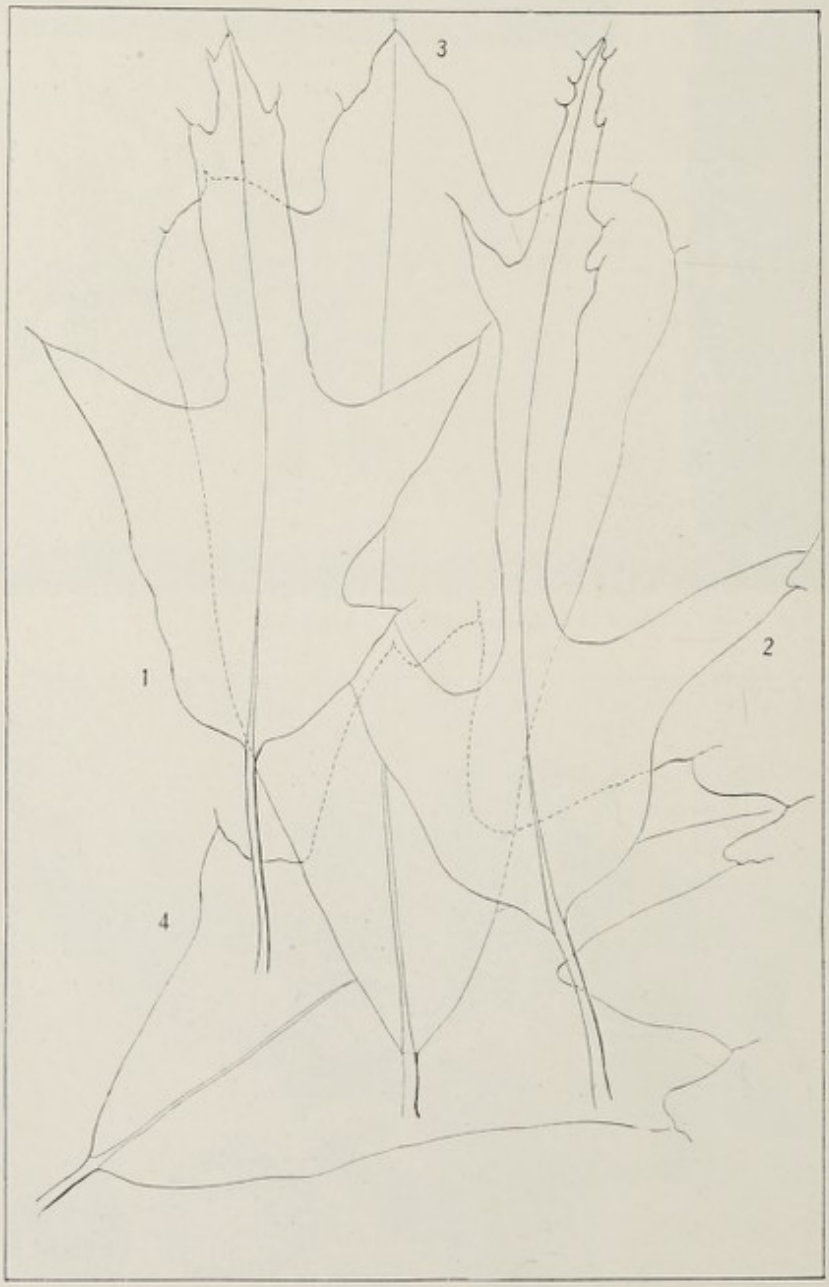
QUERCUS LAEVIS.



QUERCUS LAEVIS LINEARILOBA.

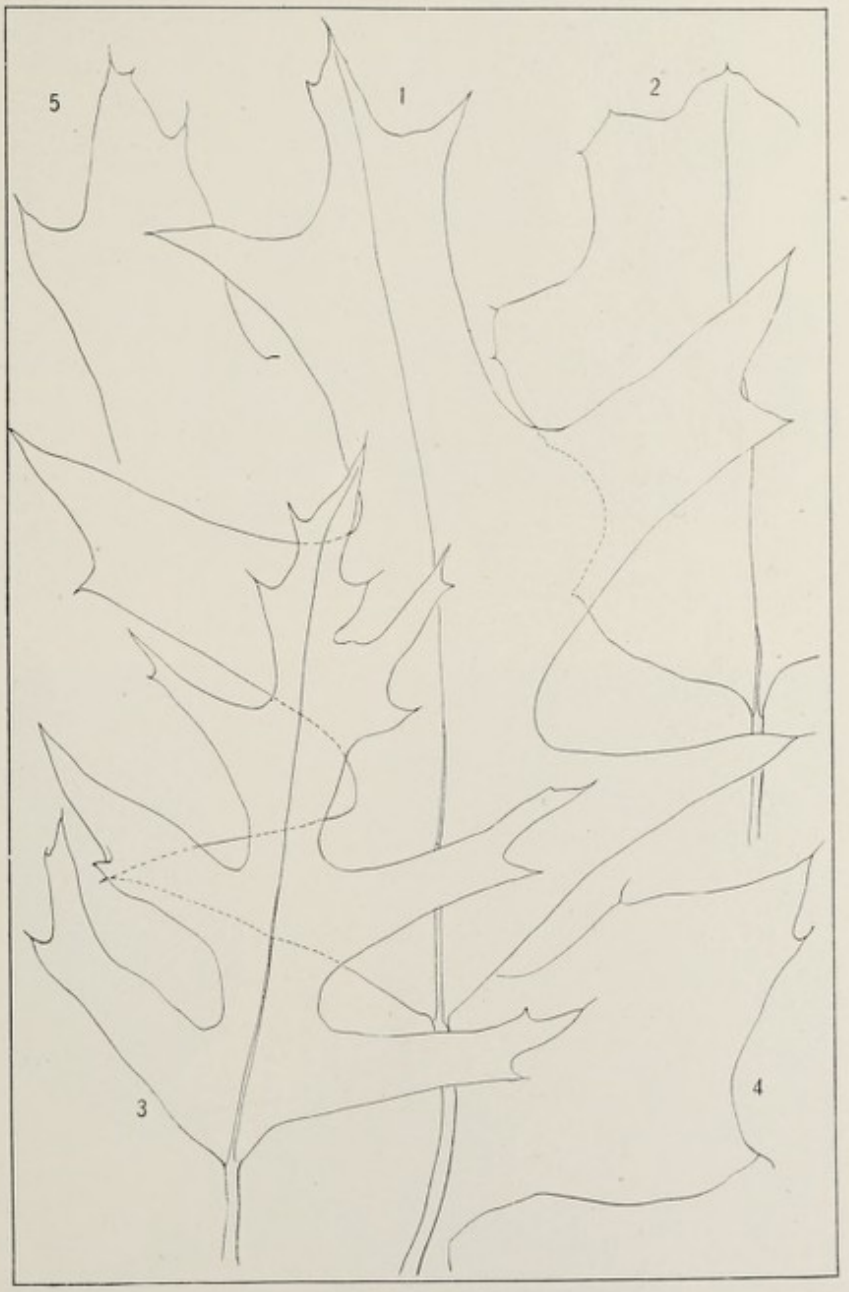


QUERCUS LAEVIS RAPPII.



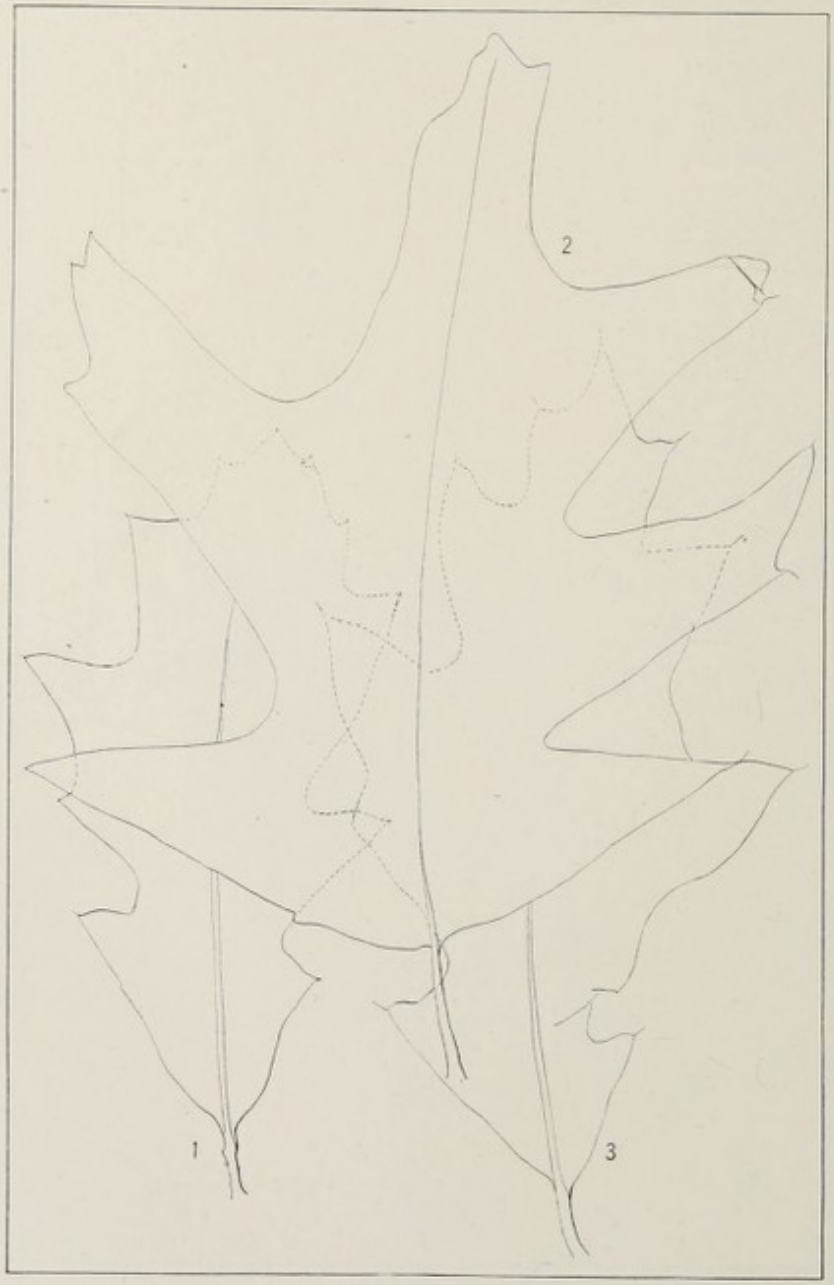
QUERCUS RUBRA.

f. typica (1), f. falcata (2), f. triloba (3), f. cuneata (4).

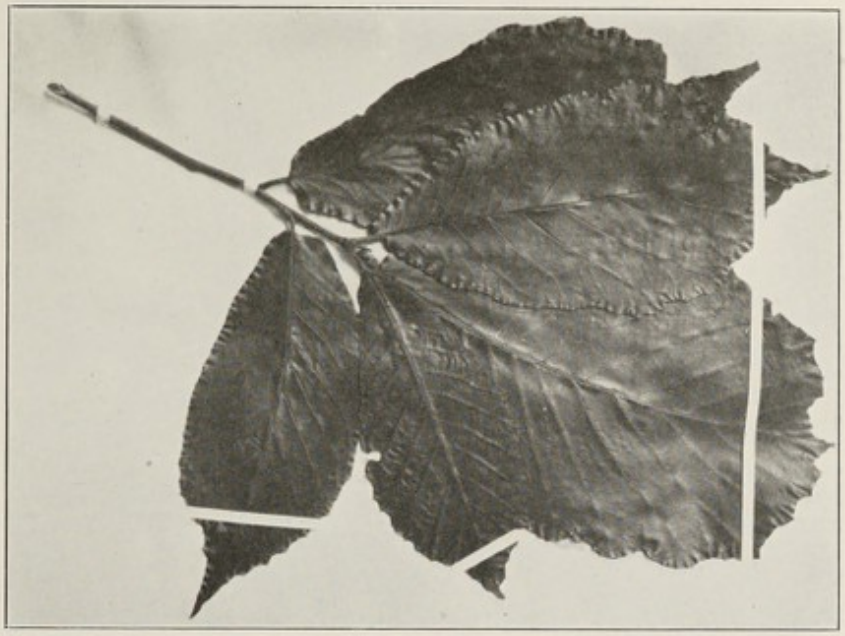


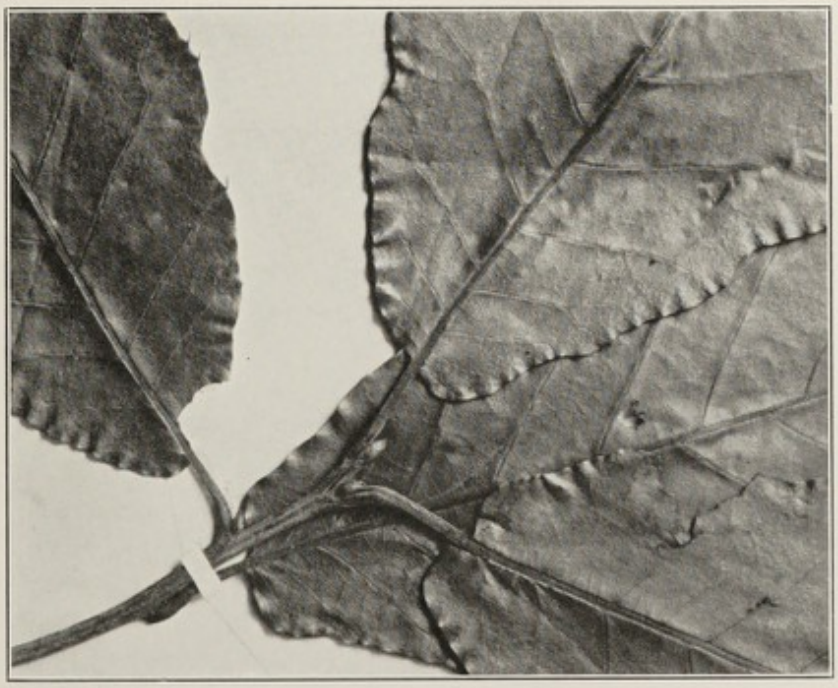
QUERCUS PAGODA.

f. typica (1), f. sinuata (2), f. cocciniaefolia (3), f. truncata (4), f. intermedia (5).

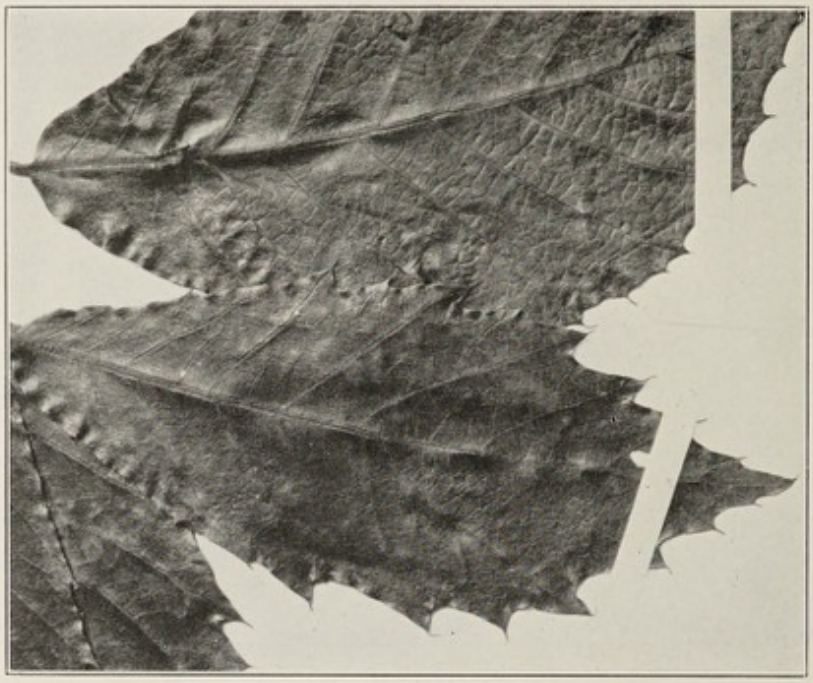


QUERCUS PAGODA JUVENILIS.





QUERCUS CALOPHYLLA.





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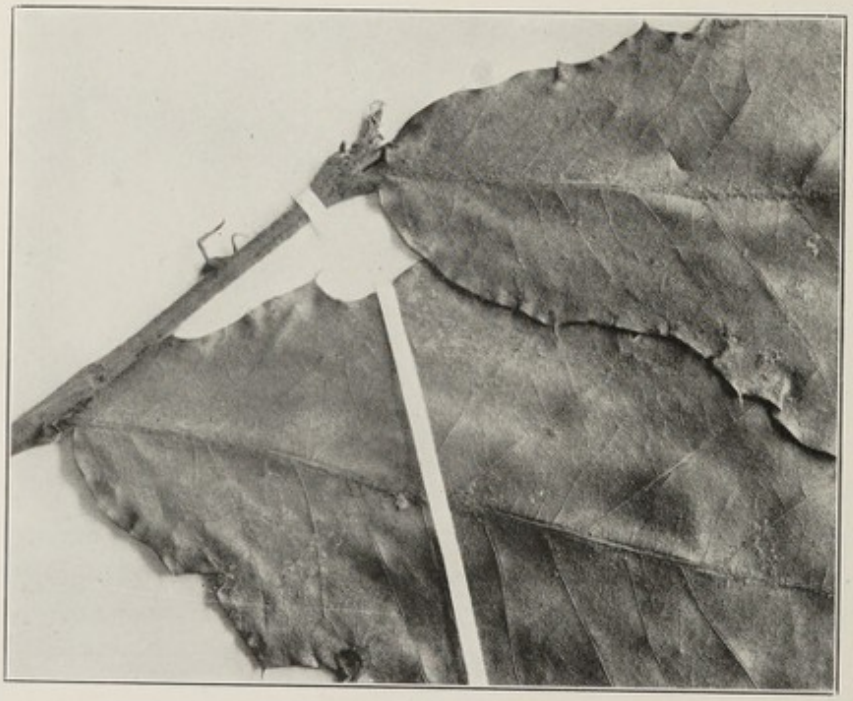
QUERCUS CALOPHYLLA WILLDENOVIANA.



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QUERCUS CALOPHYLLA ACUMINATA.



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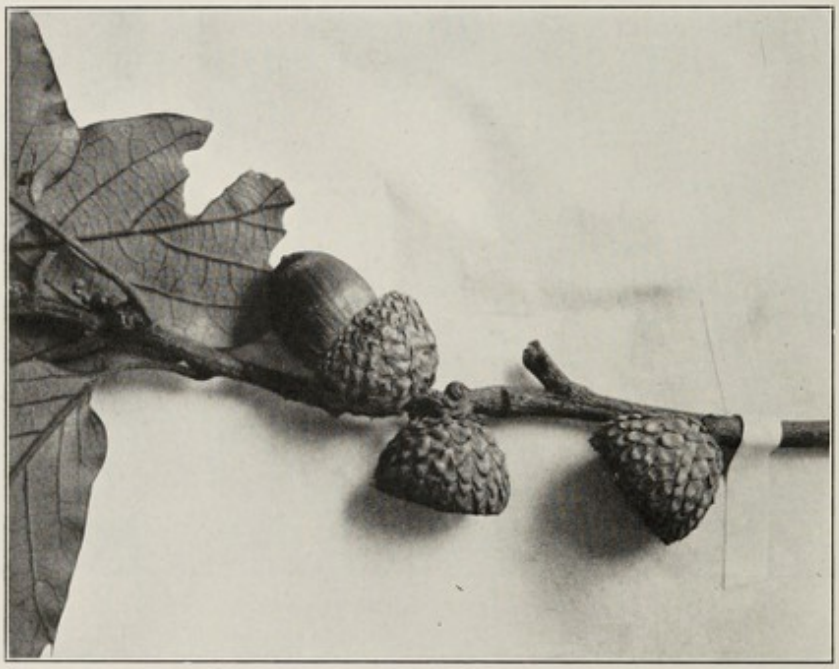
QUERCUS CALOPHYLLA INTERMEDIA.





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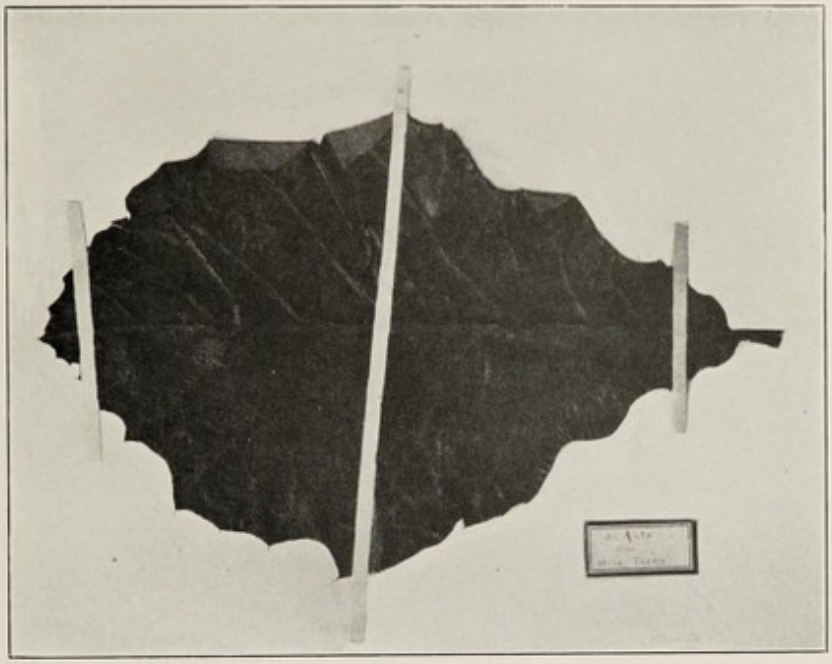

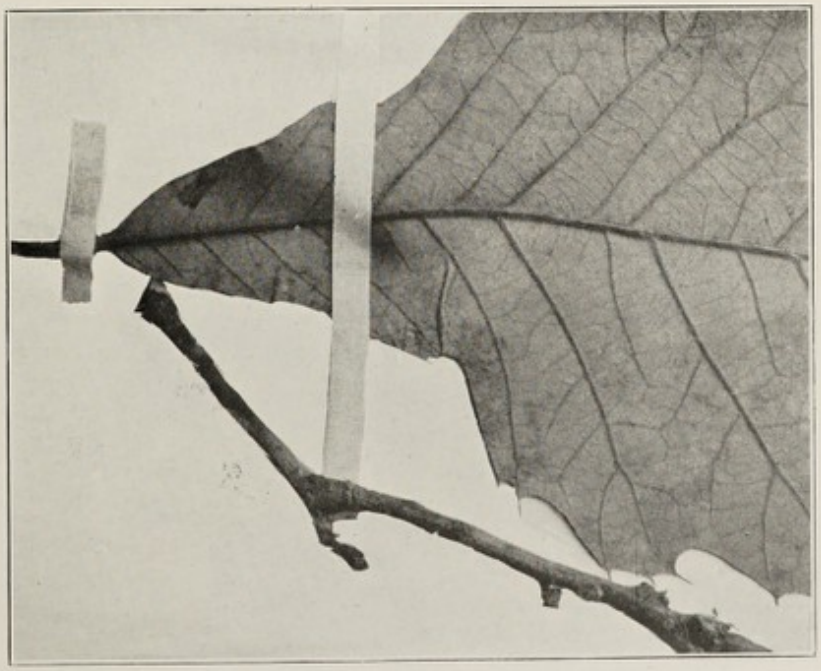

QUERCUS CANDICANS.

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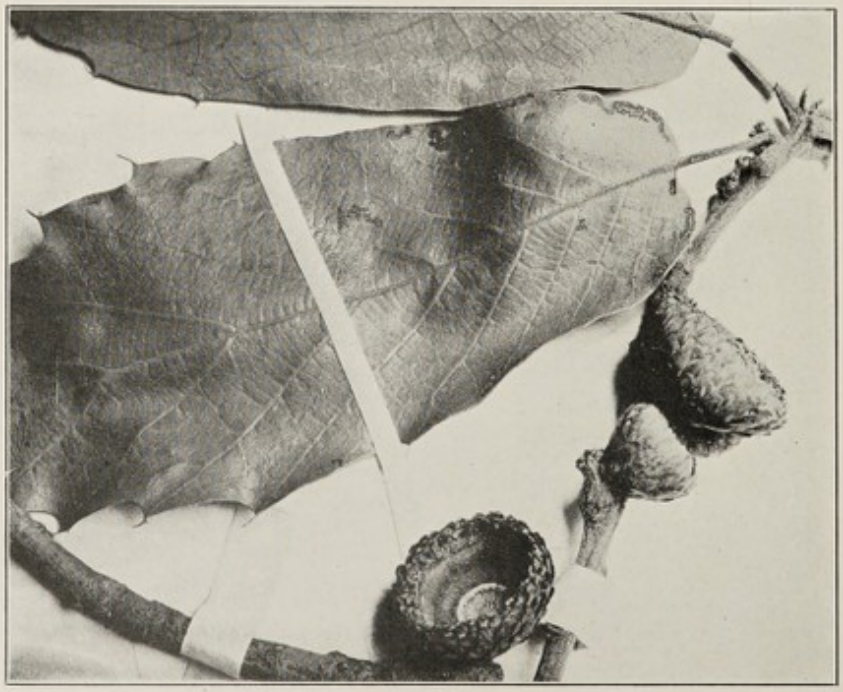

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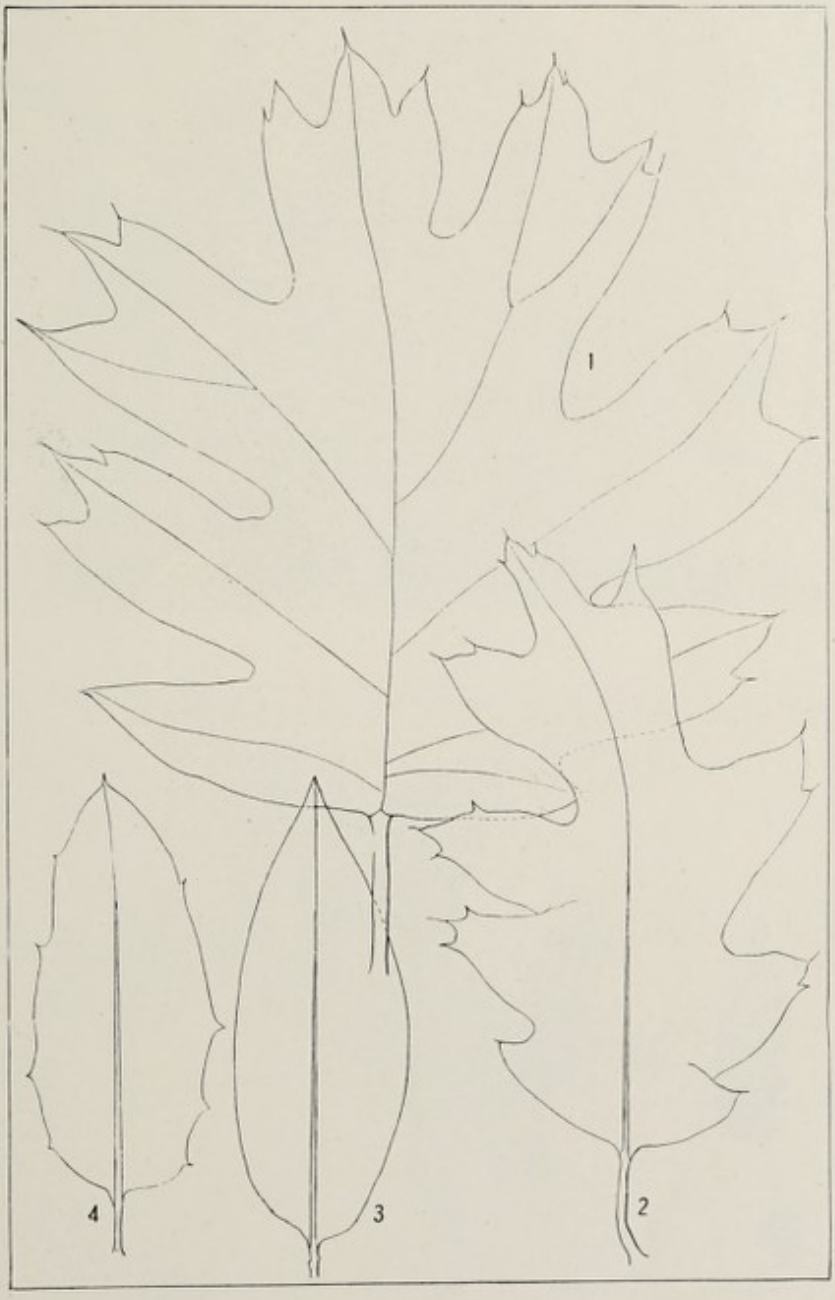

QUERCUS—THE AGRIFOLIAE.

Q. Kelloggii (1, 2). Q. Wislizeni (3, 4).

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QUERCUS AGRIFOLIA.



QUERCUS PRICEI.